THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LVII. No. 1468.] LONDON, JUNE 30, 1891. [43RD YEAR. Price 6d.

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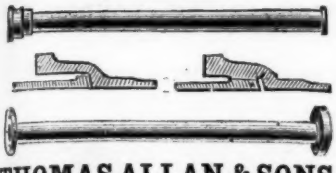
1¼ to 12 IN. BORE.



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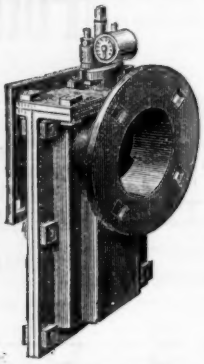

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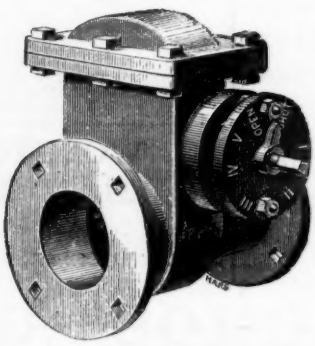

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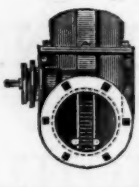

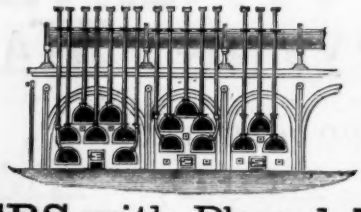

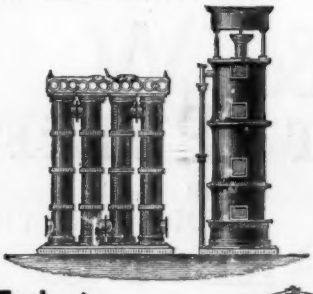

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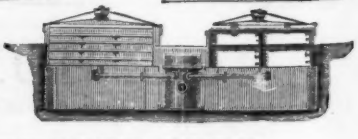

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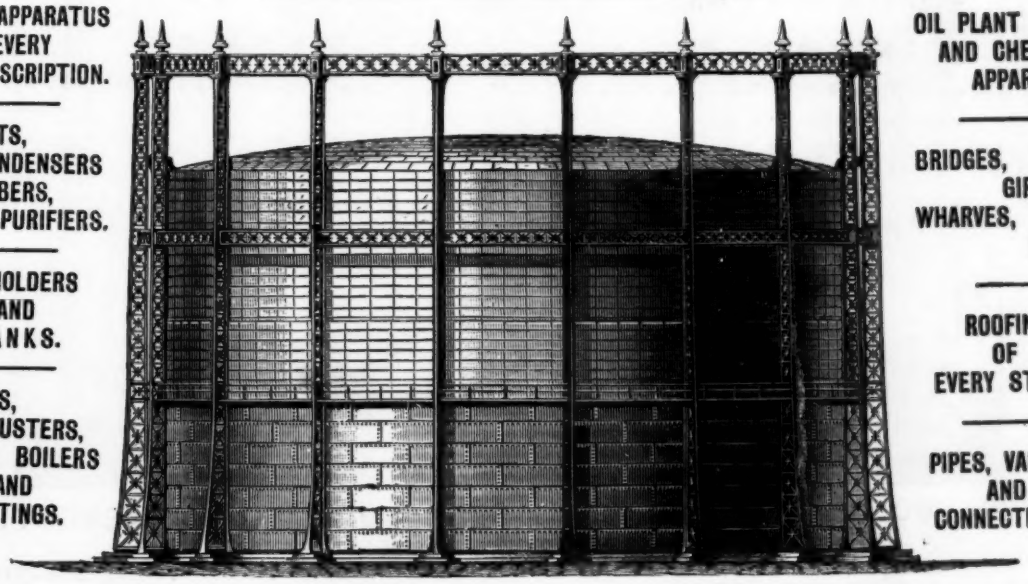

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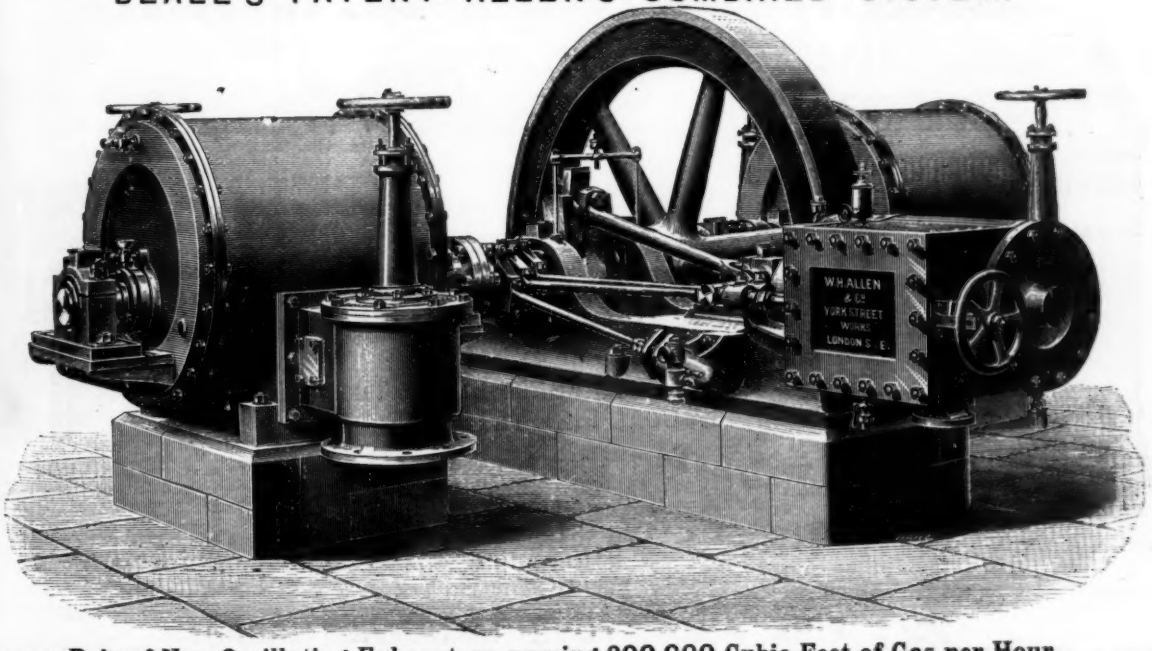

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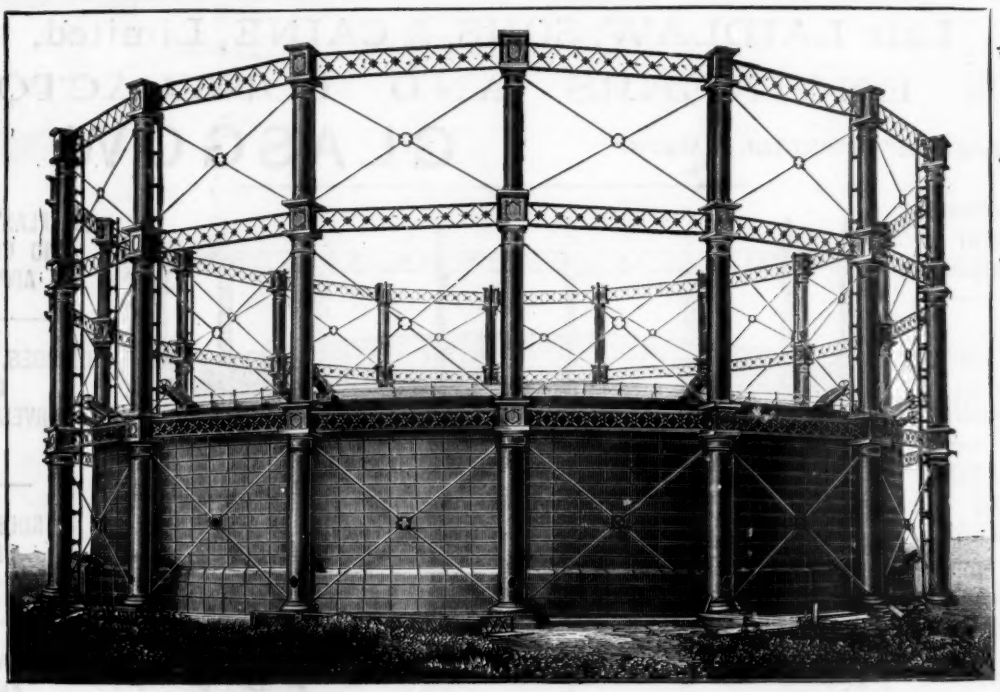

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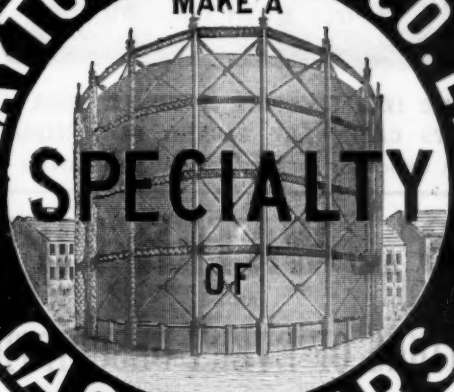

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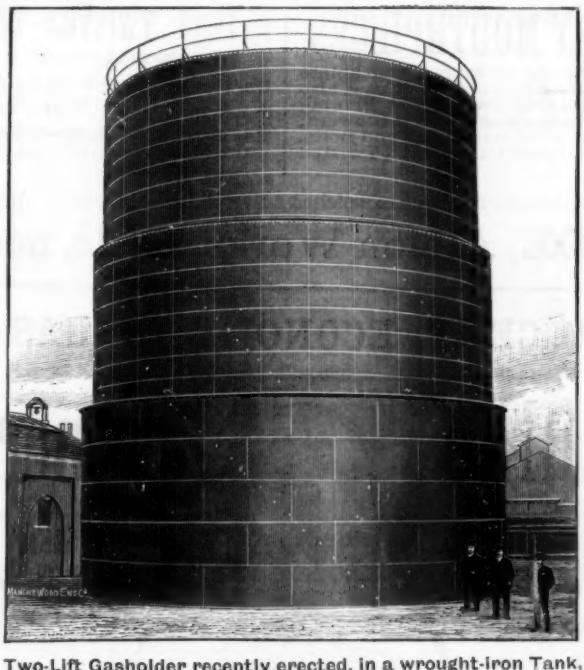

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And as there are fewer parts, there is less liability for the Gasholder to get out of order in working.

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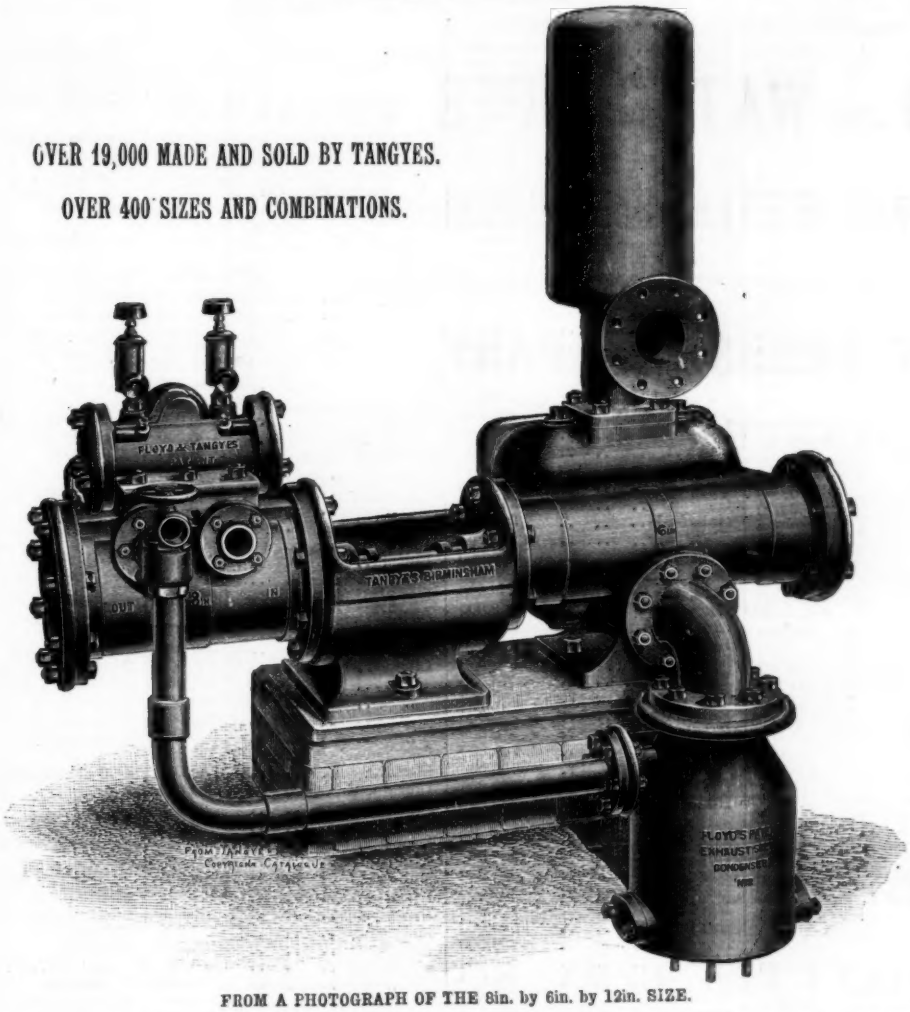

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Dover	750,000
,, ...	1,000,000
Deal	200,000
Derby	1,500,000
Dublin	3,000,000
Dowlais	100,000
Douai	500,000
Denton	500,000
Derby, U.S.A.	350,000
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Dunedin, N.Z.	400,000
Darlington	1,250,000
Detroit, U.S.A.	750,000
Edinburgh	1,500,000
,, ...	2,000,000
Enfield	300,000
Essen	300,000
Elbing	150,000
Falmouth	150,000
Frankfort	300,000
Farnworth	400,000
Fenton	400,000
Friedenshütte	500,000
Fürth	400,000
Freiburg	200,000
Goole	250,000
Glossop	300,000
Guildford	300,000
Gloucester	1,250,000
Gera	300,000
Grafton, N.S.W. ..	100,000
Grieg	300,000
Georgetown, U.S.A. ..	250,000
Gluckauf	200,000
Heywood	600,000
Holywood	125,000
Huy	70,000
Harrow	250,000
Harrogate	250,000
Halstead	150,000
Heilbronn	200,000
Havanna, Cuba	750,000
Hastings	1,500,000
Huddersfield	300,000
,, ...	750,000
,, ...	1,500,000
Hof	200,000
Hampton Wick	500,000
Heckmondwike	500,000
Haverfordwest	100,000
Halifax, N.S.	350,000
Hamm	200,000
Halle	400,000
Heidelberg	300,000
Hartford, U.S.A. ..	1,000,000
Ilkeston	300,000
Inverness	250,000
Ilkley	200,000
Ilford	100,000
Kingston-on-Hull ..	400,000
Kidderminster	750,000
Kidsgrove	100,000
Königsberg	1,000,000
King's Lynn	300,000
LONDON :—	
The Gaslight and Coke Co. :—	
Beckton	1,250,000
,, ...	1,250,000
,, ...	1,250,000
,, ...	1,250,000
,, ...	1,250,000
,, ...	1,250,000
,, ...	2,500,000
,, ...	2,500,000
Silvertown ..	1,000,000
Bromley	2,000,000
,, ...	1,500,000
,, ...	1,500,000
,, ...	1,500,000
,, ...	2,000,000
,, ...	1,500,000
Shoreditch	2,500,000
LONDON—*Continued.*	
Pancras	1,500,000
,, ...	1,500,000
Pimlico	2,000,000
Nine Elms .. (2)	3,000,000
Kensal Green (2)	3,000,000
South Metropolitan Co. :—	
Greenwich	3,000,000
Woolwich	400,000
Vauxhall	3,000,000
,, ...	3,000,000
Lea Bridge	300,000
West Ham	1,500,000
,, ...	3,000,000
Leeds	2,000,000
,, ...	3,000,000
,, ...	3,000,000
,, ...	3,000,000
,, ...	3,000,000
,, ...	2,000,000
Leominster	150,000
Leiden	560,000
,, ...	600,000
Liverpool	2,000,000
,, ...	2,000,000
,, ...	2,000,000
,, ...	2,000,000
,, ...	2,000,000
,, ... (3)	3,000,000
Lincoln	1,000,000
,, ...	600,000
Lowell, U.S.A.	1,000,000
Laclede, ,, ...	1,000,000
Louisville ,, ...	1,500,000
Long Eaton	500,000
Lille	900,000
,, ...	450,000
,, ...	750,000
,, ...	250,000
,, ...	250,000
Luckenwalde	330,000
Liegwitz	300,000
Lincoln, U.S.A.	250,000
Lawrence, ,, ...	500,000
Lynn, ,, ...	300,000
Lyons	1,500,000
Maidstone	1,000,000
Marseilles	1,500,000
,, ...	1,500,000
Mons	500,000
Malines	250,000
Melbourne	1,500,000
,, ...	1,500,000
,, ...	1,500,000
,, ...	1,500,000
,, ...	1,500,000
Manchester	2,500,000
Middleton	400,000
Manley, N.S.W.	100,000
Minneapolis, U.S.A. ..	750,000
Magdeburg	300,000
Memphis, U.S.A. ..	750,000
Nottingham	1,250,000
,, ...	2,500,000
,, ...	2,500,000
,, ...	2,000,000
,, ...	1,500,000
,, ...	2,000,000
Newport, U.S.A.	430,000
Newmarket	150,000
Newark, U.S.A.	680,000
Northfleet	200,000
New York, U.S.A. ..	2,000,000
Nice	600,000
Newcastle, N.S.W. ..	200,000
Numea, ,, ..	100,000
Namur	250,000
Newark	350,000
Nassau, U.S.A.	1,000,000
Oldbury	500,000
Otley	200,000
Oswestry	250,000
Ober Schlesian ..	1,500,000
Otto & Co.'s Coke Works	1,500,000
Plymouth	2,000,000
Parramatta, N.S.W.	100,000
Prescot	150,000
Providence, U.S.A. ..	750,000
,, ,, ..	750,000
Plauen	300,000
,, ...	300,000
Portsmouth	2,500,000
,, ...	2,500,000
Pittsburg, U.S.A. ..	1,500,000
Portland, ,, ..	560,000
Pawtucket ,, ..	500,000
Quebec	250,000
Radcliffe	750,000
Rouen	250,000
Ramsgate	1,000,000
Reigate	200,000
Richmond, U.S.A. ..	250,000
Roxbury, ,, ..	500,000
Runcorn Soap Co. ..	20,000
Rockhampton, N.S.W.	125,000
Richmond	1,500,000
Reading	2,000,000
Reichenbach	200,000
Salford	1,750,000
,, ...	1,750,000
,, ...	1,750,000
Smethwick	750,000
Sydney, N.S.W. ..	1,000,000
,, ...	1,000,000
,, ...	2,500,000
,, ...	50,000
,, ...	50,000
Sunderland	1,500,000
St. Joseph's, U.S.A. ..	250,000
Spa	100,000
Sevenoaks	300,000
St. Petersburg	2,000,000
,, ...	1,500,000
St. Louis, U.S.A. ..	2,000,000
,, ..	2,000,000
,, ..	1,000,000
Silesian Coal Co. ..	600,000
San Francisco, U.S.A.	2,000,000
,,	2,000,000
Sheepbridge Coal Co.	40,000
Stettin	200,000
Singapore	300,000
Sutton	500,000
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Tottenham	1,000,000
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Toronto	1,000,000
Uxbridge	300,000
Valparaiso	500,000
West Bromwich ..	1,000,000
Willenhall	250,000
Weston-super-Mare ..	500,000
Waltham	150,000
Wormwood Scrubbs ..	300,000
Williamsburg, U.S.A.	600,000
,, ,,	600,000
Wellington	150,000
Warwick	300,000
Wheeling, U.S.A. ..	500,000
Walker	300,000
Westgate	100,000
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Wolverton	100,000
Wellington, N.Z. ..	250,000
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Wurzen	200,000
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Yeadon	500,000
Yeovil	250,000

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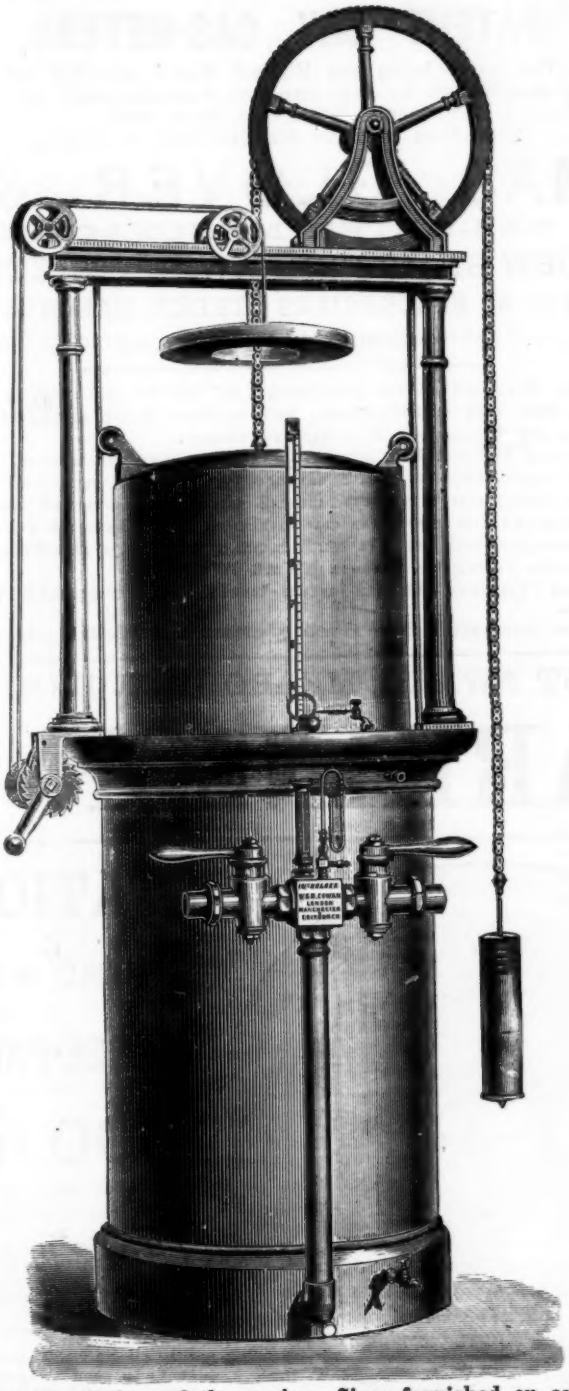

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[See also Advt., p. 1340.

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JUNE 30, 1891.

Concerning Faraday and Others.

THE centenary of the birth of Michael Faraday, one of England's most distinguished sons, has just been celebrated with due, but not exaggerated, pomp. Members, correspondents, and friends of the Royal Institution, gathered in the place Faraday himself helped so largely to elevate into its pre-eminent position as a centre whence radiates knowledge of the previously hidden things of our *cosmos*, in order to do honour to the memory of one of the truest men of science who ever lived. It is not necessary for us to add to the praise of Faraday which has rung through the press of the world since the date of his centenary; but we may be permitted to contribute our recognition of the value of an example such as his, of devotion to the pursuit of knowledge for its own sake. The seeking out of truth was his aim; and the search was even a greater reward than the results. In honouring Faraday, we honour the endeavour, which was his, more than we rejoice in the fruits of his toil, which are ours. The example of this man, who chose to dedicate his life to the elucidation of the thing that is true, instead of chasing the thing that pays, will be potent for all time. Faraday made nothing, in the commercial sense, of his discovery of the electro-magnetic spark. It was a fact; and as a fact he valued it. But he did not think more highly of it than of many other phenomena, equally true, which remain as commercially unproductive to-day as he left them. Yet it is not necessary to ask who is the worthier man—the pensioner of the Royal Institution, or the shiny-hatted person "in the City" who is known to have "made a good thing" out of British electric light concessions? The case of Faraday is, moreover, noteworthy as a standing illustration of the beneficial results of the endowment of research, which is so much discussed now-a-days. Although the trail of the competitive examination is to some extent over us all, Government and the scientific societies are urged, on the one hand, to encourage research by paying philosophers for apparently doing nothing, while other voices warn them against such an encouragement of scientific inutility. The question narrows itself down to the personal one of, Who is to be endowed? Is it your modest student, to whom truth is indeed its own exceeding great reward, although the market can offer no quotation for his productions; or is it the imposing individual who pretends to devote himself to "research" because his efforts in quest of a workable patent have resulted in failure? If we could be sure of always having our Faradays to endow, and of knowing them when we saw them, the question of the endowment of research would soon settle itself. Unfortunately, the world perceives this class of genius best after its exemplar has been dead for a quarter of a century or so.

While contemplating the Faraday centenary, we are irresistibly drawn to reflect upon the peculiar case of the great industry with which the JOURNAL is identified—not because it has any particular connection with Faraday or with any other luminary of the Royal Institution, but for the contrary reason. Verily, the gas manufacturer has little to do with the philosophers, or the philosophers with him. The eminent predecessor of Faraday—Sir Humphry Davy—as we know, did not believe in coal gas. But then tradition avers that he did not greatly believe in Faraday either; so we need not fret over this particular instance of a great man's fallibility. It is, however, a truism that the coal gas industry, as an art or as a manufacture, owes hardly anything to the eminent men of science who have grown up beside it. Like the railway and the steamboat interests, philosophy, although concerned with the facts of cosmical existence, has passed it by on the other side. We instil into our budding gas engineers respect for such men as Faraday; but at the same time we must admit that it is not to these that we should ascribe the credit for founding and developing an industry that honourably employs tens of thousands of men, and returns a profit on the investment of some 100 millions of capital in the United Kingdom alone. Among all the titled and eminent men who posed before the world as honouring Faraday on the 17th inst., there was not one whose name expressly symbolized the coal gas industry. There were physicists and electricians galore, and a few civil engineers and chemists; but of gas engineers not one. Nor is there any particular reason why it should have been otherwise. We admire and revere Faraday, and would wish to see more like him; but he was not of us any more than were we disciples of his in his lifetime.

Yet in this reflection there is no occasion for regret. Let us be content with the true practical service that the gas industry renders to mankind, without repining for the absence of that halo of scientific distinction which we must not hope to inherit. If ours is the Martha of the arts, let us live the part with a sense of the truth that there is consolation in being indispensable, for those to whom Fate has denied brilliancy. There are, as Chaucer says, in the service of humanity, vessels of wood as well as of gold—the one as worthy in their place as the others. The world would be a very much less comfortable place to live in than it is if it had not been for the labours of insignificant and almost unknown men like Macadam the

road mender, Murdoch the mechanic and gas maker, and others of the innumerable company who have been ignored by Royal Institutions and Imperial Academies of every country and time, yet were content to do their work as best they could for what it was worth.

The Gas Supply of Manchester.

In the actual condition of the affairs of the Manchester Corporation Gas Department, the report of the Gas Committee for the twelve months ended March 31 last, which we give elsewhere, is specially interesting. It is to be noted that the output for the year shows a remarkable increase; not less than an additional 44,385 tons of coal and cannel, or an addition of 14·7 per cent., having been carbonized at the different works, which were therefore taxed to their fullest capacity. The usual explanations are offered for this abnormal expansion of business; and those who are agitating for cheaper gas in the city must be prepared for the use of these figures by the "old stagers" of the Committee, as proof that gas is cheap enough already, since the high price does not check development of consumption. The total revenue of the Department from all sources, for the financial period under consideration, was £488,424, which is an increase of £54,073 upon the returns for the previous year, notwithstanding the reduction in the price for gas consumed in certain townships recently included in the city. Gas, as well as every residual, returned more money; the increase in the case of coke being especially noticeable. For this good result the Committee pat themselves on the back; stating that it "has been obtained by careful attention on the "part of the Committee and the responsible officials." Evidently, the members of the Gas Committee of the Manchester Corporation have no need to join in the traditional Scotch petition: "Send us a guid con- "ceit o' oursels." It may be permitted to disinterested criticism to remark that "careful attention" to their duty is usually expected of all corporation committees and their officials of every degree; and it is a novelty—and not a pleasant one—to find members of such a body taking praise to themselves for anything of the kind. Moreover, such bids for applause are apt to arouse a spirit of opposition; and in this case one is tempted to inquire how a Committee, or any number of officials, can be held responsible for an improved condition of the coke market following upon a winter which they admit has been exceptionally severe? And is it to be understood that this Committee are prepared to work the rule both ways, and submit to blame when coke or anything else which they have to dispose of is unsaleable save at an "alarming sacrifice"? It is much pleasanter to note the statement in the report, that the greater proportion of coke produced in Manchester is now consumed locally. Whether or not this local use of coke has had any material effect upon the production of black smoke in the district, may be matter for conjecture. We fear that this paragraph of the report was inserted as a sop to the local opposition, which is making the Committee uncomfortable; but such a concession to sentiment will hardly go far. The gross profit for the year on the gas undertaking was £97,276, out of which, in addition to the necessary payments for interest and sinking fund, the Committee allowed £22,386 for the cost of gas consumed in the "free" public lighting, and gave £10,000 to the city fund. They then wiped off their adverse balance of £26,277, and had £11,268 left, which has been carried forward to the renewals account.

There is a special report on the question of a reduction in the price of gas, which, with all desire to recognize the fact that the Committee are feeling the pressure of public opinion, we must characterize as funny reading. They were instructed by the Corporation to consider this question; and they appear to have done so according to their lights. The result is a reminder of the fact that, as from March 31, the cost of the public lighting is not to be borne by the Department, which will conduce to a lowering of the price of gas to the consumers who have hitherto borne this burden. Then it is stated that the charge which has hitherto been made upon revenue for depreciation, will also cease; but if this is to be replaced by a charge on behalf of the Thirlmere water scheme, the gas consumers will hardly realize much difference in their circumstances on this account. Lastly, the Committee seriously assert that, with the best will towards the consumers, they do not think it advisable to be in too great a hurry to cheapen the gas; because the works are not in a condition to cope with the actual demand, much less the increased sales that a lower price might be expected to bring! Then, we may ask, what sort of management is this to which the Manchester Gas Committee plead guilty? Does not such a confession yield the point we have been pressing on the Corporation for years, as to the absolute necessity of giving a Head to their gas undertaking?

Gas at Exhibitions.

There is some agitation among the representatives of the gas industry of the United States over the scornful treatment of illuminating gas by the authorities of the prospective Chicago Exhibition, who have proclaimed their intention of having no more to do with gas for lighting purposes than can be helped. The suggestion has therefore been made that combined action should be taken by those who are financially and professionally connected with the American gas industry, to secure a fair and adequate representation of this great national interest at the Chicago show. Up to the present time, however, the idea has only been talked about—mainly by Western gas engineers—and nothing has been done. And we have no hesitation in declaring ourselves in agreement with those who are averse to anything like copying for Chicago, the French Gas Companies' proceedings in connection with the last Paris Exhibition. Our French colleagues meant well by what they did on that occasion; and they did it very nicely. Let us hope they were satisfied with the result. For our part, we entertain the opinion that these demonstrations of gas as gas, and, as far as may be, independent of apparatus, cannot be conscientiously held to have hit their mark, either in Paris or in any other instance. We have thought differently; but that was before the experiment had been sufficiently tried. The idea of exhibiting the capabilities and advantages of gas in the abstract, as it may be called, is a taking one. But it has been attempted on an ample scale, and under the best auspices, more than once; and, so far as the holiday public are concerned, even such a costly experiment as that of the French Gas Companies in 1889, if it can hardly be said to fall absolutely flat, fails to command interest commensurate with its intrinsic worth. These experiments are technically instructive; but when people go to exhibitions, they do not particularly care to be technically instructed. This observation does not apply only to gas exhibits at such shows as those of Paris or Chicago. It is equally true of almost everything else that happens to possess what may be called serious purpose. People go in reality to exhibitions to be entertained, and made to gape with amaze at certain sensational exhibits. They only use the educational argument in their own defence. In short, the vast majority of visitors to exhibitions are on precisely the same footing with farmers who go to market too regularly, merchants who attend smoking-room exchanges, *dilettanti* who follow itinerant scientific societies' meetings—the business is merely the excuse; the pleasure is the attraction. It is nôt to be supposed that the gas industry of the United States will be affected in the least, whether or not a single gas-flame is seen burning in the Chicago Exhibition. The part to be taken by makers of gas apparatus in the show is another consideration. The manufacture of such appliances is a flourishing American industry, and ought therefore to be duly represented at Chicago. With regard to gas itself, however, we have the idea that the public use it for the same reason as they consume wheaten flour—because they cannot do without it. A Bread Exhibition would naturally and necessarily be a comparative display of methods and appliances for bread making; for Ceres is her own defender, and needs no patronage from gods or men. So let it be in the case of the modern genius of Gas, if a prosaic age permits us the fancy of such an impersonation. One of her acolytes may wax fat, while another languishes in neglect; but she herself aggrandises, because she is essential in the scheme of the civilized existence of mankind.

Coal Tar and Explosives.

Accustomed as the world has grown of late years to regard coal tar as one of the most wonderful compounds in the whole range of semi-artificial products from which chemistry appears to be able to derive whatsoever its skilful practitioners will, it is not without a little surprise

that one discovers this accommodating fluid in the list of preparations over which Her Majesty's Inspectors of Explosives keep watch and ward. What, it might be asked, is tar, of all the quiet compounds in the world, to these careful gentlemen; or the products of tar, that they should meddle with it or with them? Is not coal tar the safest, least inflammable, and least explosive, of all known fluid hydrocarbons? Tar itself is all this. But the chemists will not leave it alone; and some of the derivatives which they obtain from it are either explosive in themselves or offer, on various grounds, to form desirable additions to explosives. Thus, in the last annual report of the Inspector of Explosives, mention is made of several new compounds of this nature into which coal tar products enter. The most noteworthy of these is a proposed addition of nitrated coal tar to smokeless powder as licensed; the new variety to be called "Smokeless (S.R.) "Powder." It was, however, found that the addition endangered the stability of the powder; and it was adversely reported upon. Seeing the demand that exists for smokeless powders and for blasting preparations which can be safely handled, it may be expected that the occult chemical combination of elements which constitutes what is known as coal tar will be still further drawn upon for products of this character as time goes on. The most satisfactory feature about these new explosive chemicals is the fact, shown by the Government reports, that their manufacture and use are attended with fewer casualties than accompany the handling of old-fashioned gunpowder. After all is said, however, it is a curious trade; and not one with which many people would care to meddle.

An Eruption at St. Louis.

Having been informed on several previous occasions that we know nothing about the secret springs of gas management in the United States, it is with much diffidence that we venture to ask what is the "true inwardness" of the recent disruption at St. Louis, which is being seriously discussed by the technical and local press. The incident has a more immediate bearing upon a particular side of the English gas interest than appears on the surface. The patent fact is that Mr. Frederic Egner, the Chief Engineer of the Laclede Gas Company of St. Louis, of which Mr. Emerson M'Millin is President, has been asked to resign; and "thereby hangs a tale." As was reported in last week's issue, Mr. Egner presided over the last meeting of the Western (U.S.A.) Gas Association, and pronounced an address which contained some very plain speaking about the financing of American Gas Companies and their dabblings with electric light speculations. It so happens that something of this kind has been going on in St. Louis, where Mr. George Shepard Page, Mr. M'Millin, and some others, have been engaged in conducting certain brilliant financial operations that have resulted in loading the gas supply of the city with a considerable increase of capital, without ensuring, up to the present time, any marked compensating advantages either to the stockholders or to the public. Rumour has it that as soon as Mr. Egner's address got in the wind, its author was visited with virtual dismissal from his office. How far this is true, we know not; the only certainties in the matter being that an address was delivered, and a request to resign followed. The next complication of the incident is the report that Mr. M'Millin himself, who is suffering from the effects of an accident, which incapacitate him from active bodily exertion, is about to retire from the Laclede Company, and let somebody else try his hand at setting its affairs in satisfactory order. Now, this is the significant point of all these "alarms and excursions." The St. Louis "deal" was to have been the starting-point for a good many other operations of the same order in all parts of the States, by which English capital was to have been caused to flow in this direction, perhaps to the advantage of the investors, certainly to the profit of the operators. The question now, as a slangy young stock-jobber might phrase it, is: "What price Lacledes?" We shall await further particular information upon this subject; in the meantime extending our sympathies to Mr. Egner, who appears to have become a victim because he established the dangerous precedent of talking, in an American gas managers' meeting, of matters of real interest to the profession and the community, instead of confining himself to the safe commonplaces and bland puerilities that some maintain should serve for such occasions.

WATER AND SANITARY AFFAIRS.

The inquiry into the Metropolitan Water Supply, as conducted by the Select Committee of the House of Commons presided over by Sir Matthew White Ridley, has terminated in a kind of *tabula rasa*. Of the six Bills referred to this Committee, the only one that has survived is that of the Southwark and Vauxhall Water Company. "Preamble not proved" was the decision announced on Friday in the case of the Metropolis Water Supply Bill of the Vestries, and the London Water Commission Bill of the Corporation. The Croydon Water Bill is withdrawn, as a natural result. The London Water (Meter) Bill has been abandoned; and Mr. Causton's Charges Bill is virtually dead. The board being thus swept clean, the Committee meet to-day to draw up a special report for presentation to the House. Having sat twenty-three days, they are now about to give Parliament the benefit of certain conclusions, founded on the evidence laid before them, and on the speeches to which they have listened. It would be interesting to know how much this special report will have cost from first to last, in the shape of fees to Counsel and other outgoings. It ought to be a valuable document, to compensate for all the expenditure of time and money involved in its production. We presume it will tell us, as we were told eleven years ago, that the Metropolitan Water Supply ought to be placed under the control of some public body. We may further expect that the report will point to a particular combination of the County Council and the Corporation of the City of London as furnishing the authority for this purpose, possibly in the form of the "Statutory "Committee," proposed early in May last by two of the Committees of the County Council, and agreed to by that body, as also by the Corporation. This scheme has been laid before the Select Committee, and has been received with favour by Sir Matthew Ridley and his coadjutors. Whether the special report will recommend any representation of the outer areas, is only open to conjecture; and it is difficult to see how this representation is to be given, except by creating an organization so large as to be unwieldy. It is quite likely that this question of the outer areas will be found more difficult to settle than is commonly apprehended. The supply of water in bulk is an impracticable notion; and we can scarcely suppose that the idea is seriously entertained. West Ham is asking for complete severance and an independent supply—a claim very likely to be put forth in other quarters, though not one that can be wisely granted. The most reasonable course, and the safest on public grounds, appears to be that of comprehending in one system the entire area at present supplied by the Metropolitan Water Companies, with such extensions from time to time as the spread of the population may demand.

It is evident that the labours of Sir Matthew Ridley's Committee are purely initiatory. It may even be said that the Committee have done as little as they could. To have gone fully into the subject placed before them would have demanded far more time than the present session could have afforded them. To avoid this dilemma, the Committee, while invested with power to go as far afield as they pleased, thought it better to narrow their investigation as much as possible. The Chairman has himself declared that the inquiry is incomplete; and we shall not be surprised if the special report recommends the immediate appointment of a Royal Commission, for the purpose of conducting an investigation which shall be of an exhaustive character. If there is to be any further inquiry at all, we may expect it to precede the purchase of the undertakings of the Water Companies. The Select Committee may possibly recommend definite modes of proceeding with reference to such a purchase, though they can scarcely go beyond certain broad principles. Supposing the subject of the water supply, in all its branches, to be taken up promptly by a Royal Commission, there looms behind it the introduction of a Bill by the Government—a step which we fancy the Government would rather not take. Yet, to form a "Statutory Committee," such as is now proposed, and to hand over the inquiry to that kind of authority, would simply be placing the whole subject in the hands of the County Council. How much remains to be gone into is indicated by one incident during the recent sittings of the Committee. Mr. Pember proposed to call

evidence showing that the Companies had done their duty in the past, and were prepared to meet all emergencies that might arise in the future. But the Chairman signified that this evidence on the part of the Water Companies "could not be accepted." The vital character of such evidence, at least with regard to the future, is palpable; and the facts must be heard somewhere, if the subject is to be properly dealt with.

A suggestion made to the Select Committee by Mr. Pember in the course of last week's proceedings was not amiss. It was that many of the purposes sought to be effected by the Metropolis Water Supply Bill, could be much better carried out by the amalgamation of the Companies than by their extinction. The London Water Companies have never shown a disposition to amalgamate; and yet, if all the undertakings were now consolidated into one, the interests of the shareholders would be somewhat the safer for such an arrangement. The danger attaching to a partial purchase of the undertakings, and even the risk, in a district where there are two supplies, of one only being purchased, is a contingency which makes itself apparent. The risk may be remote; for such a procedure would seem too unjust for Parliament to tolerate. But the peril would have been entirely prevented by a timely policy of amalgamation. Concerning the mode of purchase, it is to be hoped that the special report of Sir Matthew Ridley's Committee will lay down some just and equitable principles. The purchase need not be long delayed, unless there is to be some roundabout process, designed to depreciate the value of the property before proceeding to buy it.

Madame Alting-Mees.—At the recent meeting of the Société Technique du Gaz en France, Madame Alting-Mees was admitted an associate member; and, in recognition of the services she has rendered to the gas industry in France by her attractive lectures and demonstrations in cooking by gas, it was decided to forego the admission fee of 100 frs. required from this class of members.

Presentation to Mr. W. Fairweather, of Kilmarnock.—At a social meeting of the employees at the Kilmarnock Corporation Gas-Works, held last Thursday evening, the Manager (Mr. William Fairweather) was presented with a travelling-bag and field-glass, with suitable inscription, as a token of their esteem. Mr. W. Renton occupied the chair, and called upon Mr. D. Findlay to make the presentation. Mr. Findlay said it afforded him much gratification to perform the pleasant duty that had been allotted to him, of giving expression to the feelings entertained by the workmen towards their worthy Manager. Mr. Fairweather, in reply, said the presentation had come upon him as a surprise, and he thought altogether it was undeserved, as anything he had done in the past was what he considered to be his duty. He was glad to find his efforts were appreciated by his fellow employees; and he hoped the good feeling which had existed hitherto would still continue. He thanked them most sincerely, not only for the expression of their good feeling for his wife, family, and himself, but also for the handsome gifts of which he had been made the recipient.

Incorporated Association of Municipal and County Engineers.—The annual dinner of this Association (of which Mr. T. Cole, Assoc. M. Inst. C.E., is the Secretary) took place last Thursday at the Holborn Restaurant. The President (Mr. T. De Courcy Meade, Engineer of the Hornsey Local Board) was in the chair; and there ware present about 100 members and visitors. Among the company was Sir Henry Owen, Permanent Secretary of the Local Government Board, who, in responding to a toast in connection with his department, remarked that no one realized better the importance of the duties which devolved on Borough Engineers than the Board. It was a remarkable fact that during the last ten years the outstanding loans of the various Municipalities and Local Boards had increased from 63 millions to upwards of 100 millions. It would have been impossible for such large works as this sum represented to have been carried out, had not a great change come over the opinion of the country in favour of sanitary legislation. From his own official experience, he might say that at no time had the duties of Borough Engineers been more sedulously or satisfactorily discharged than they were at the present time. In responding to the toast of "Success to the Association," the President said it was founded some 20 years ago, and since that time had gone on steadily increasing in numbers, and, he felt sure, in importance also. The endeavour of the Association had been, from the beginning, to improve the *status* of Municipal Engineers, and advance their knowledge; and he ventured to think that this had done a good deal towards the improvement of each individual member. A few years ago the Association started voluntary examinations; and he was pleased to say that, although they had only been commenced for so short a time, a large percentage of the men who had presented themselves as candidates were at the present time holding municipal appointments.

THE INCORPORATED GAS INSTITUTE.

PROCEEDINGS AT THE TWENTY-EIGHTH ANNUAL GENERAL MEETING,

HELD AT THE

COUNTY HALL, CARLISLE, JUNE 9, 10, & 11, 1891.

Mr. J. HEPWORTH, M. Inst. C.E., President.

We complete to-day our report of the technical business at the above meeting, by giving the three papers taken on the morning of the 11th inst., with the discussions thereon.

Mr. C. NICKSON (Manchester) read the following paper:—

GAS WORKERS' STRIKES: WITH SUGGESTIONS FOR THEIR PREVENTION.

In the brief paper I am about to submit to this meeting, there is little or no need that I should enter into details as to the origin of the strikes which have been so numerous of late years, or as to the matters in dispute which have been deemed of sufficient importance to justify a strike. Are they not all fully recorded and set forth, without bias or prejudice, extenuation or malice, in the local newspapers, and in Metropolitan and other journals? And do not the balance-sheets of corporations and companies—showing diminished reserve funds, increased cost of labour, requiring an advance in the price of gas, not to mention reduced profits, and large sums expended in the struggle—each and all record in forcible terms the history and character of these strikes? Nor is this all. They have been disastrous alike to employers and employed; and many a ruined home, pauperized workman, and wives and families needing bread, confirm the facts which balance-sheets reveal.

These disputes are called "strikes" or "lock-outs," according to the point from which they are viewed. But, by whatever name they are called, they are disastrous; and success is only less so than defeat. Briefly stated, they generally arise from one or other of the following causes, upon which, however, I do not propose here to enlarge:—

(*a*) Rate of pay.
(*b*) Hours of work.
(*c*) Amount of work to be done: Coal to be carbonized, &c.
(*d*) The recognition or non-recognition of the workmen's union.
(*e*) Miscellaneous causes—personal or accidental disputes which have arisen at certain works.

Those of us who have passed through the strife (or perhaps, better still, those of us who have had no strife to pass through, but have viewed the battle from afar) will be able to place the strikes under their respective heads, and rightly apportion blame or praise. But I submit that, whatever the cause of strife—whether one or all of these combined—it ought not to be, and is not, impossible, in this waning half of the nineteenth century, distinguished as it is for intelligence and public spirit, to prevent or settle these disputes without recourse to the clumsy, cruel, and barbarous "strike."

My desire is to consider the subject fairly and in a spirit of goodwill as between man and man, whether they be employers or employed; and I accordingly venture to submit to you the following propositions:—

(1) Both masters and men have the undoubted right to make the best possible terms for themselves—giving a broad, just, and, if you please, a human meaning to the term "best"—which, on the one hand, will provide that masters will not cruelly coerce and grind down the men, and, on the other hand, will secure for the masters individual and general obedience to authority, and honest work on the part of the men.

(2) Both masters and men have the undoubted right to combine for the promotion and protection of their respective interests. Looked at in the light of the preceding paragraph, and in the light of common sense, these respective interests are not antagonistic, but are so interwoven and mutual that they are essentially one.

(3) A union established only to promote and assist strikes can only be mischievous in its effects, and, as the men have more than once proved, will be found wanting in the day of trial. A union established to keep down wages and

to prolong the hours of labour will be equally mischievous, and will also end in failure.

(4) Assuming now that certain rates of pay, hours of labour, and conditions of work have been agreed upon and faithfully carried out on each side, after due notice is given the men have a perfect right to cease work and the masters to dismiss the men; but men so leaving work have no right to prevent or to put any hindrance in the way of other men accepting what they have refused. Nor have masters any right to prevent the dismissed men being engaged elsewhere. Mr. George Howell, M.P., in his recently, published book on "Trade Unionism," wisely says: "If union men so comport themselves that employers will seek them in preference to other workmen, the question is solved."

To me it seems that, if these propositions are admitted, and the arrangements involved carried out without passion or prejudice, fear or favour, except the just consideration which must and always will be shown to the faithful workman over the unfaithful, to the kindly master over the unkind, there will be little or no occasion for disputes, much less for strikes or lock-outs. As I suppose, however, there will after all arise disputes, even in the best-regulated works, I will now inquire how these disputes can be settled without having recourse to strikes or lock-outs. Not that I can suggest anything new, or that my suggestions themselves will be other than common-place; but they are given in all sincerity, after much thought, and as the result of a painful experience, which brought the writer into touch with varied phases of the question.

1. It is of the utmost importance that a spirit of trustfulness and mutual goodwill be assiduously cultivated as between masters and men, managers and managed. There is, unfortunately, too often a spirit of suspicion, fear of trickery, and general distrust. In reply to a question relating to a very small matter, "Cannot you trust the Committee?" a man replied, "We don't want trust, we want ready money;" and there was a world of meaning in his answer. Is it, however, a thing incredible that there should be masters who are worthy of the fullest trust, and who have at heart the best interests of the men; and that there should be men who are as worthy of the confidence of their masters? If there are not such, there surely ought to be; and the existence and cultivation of these friendly and trustful relationships will go far to prevent, or if they do arise, to settle disputes.

2. It is also of as great importance that all arrangements as to rates of pay, hours of work, overtime, notices, and conditions of labour, be clearly and fully defined. Over and over again, we have seen that strife has arisen from this matter not being properly attended to. It is to be feared that in some cases there have been unworthy reservations, and that, when a supposed opportune time has arrived to gain an advantage, the opportunity has been too eagerly seized; and this has caused a renewal of war, an increase of bitterness, and a deep desire for reprisals. Let there be, therefore, definitions so clear and distinct that all may understand and none can misunderstand.

3. The rightful authority of the manager in the works and over the men under his charge ought to be rigorously maintained; and a wise manager will certainly not coerce his men or treat them harshly. No interference from any source whatever should be permitted to undermine a manager's influence. He ought to have the confidence of his directors; and be able to secure the respect of his men. He should be as quick to note good work and commend it, as he is to see bad work and reprove it. Whether it be in reproof or commendation, "a word fitly spoken how good it is!" I do not much like the terms which are often applied to a gas-works manager—to wit, "he must be able to *manage* men." Quite true, in a sense; but the less they see of his managing, the better. Moreover, the men ought to need little or no management. They know what their work is, and how to do it. They are no slaves to be driven by stroke of whip to work and duty, but men with minds and consciences, able and willing to do a fair day's work for a fair day's pay. The pity of it is when a manager is made the scapegoat on whose head are laid the sins of those who are too ignoble to bear their own, but who are only too ready to take credit for good which they themselves have not accomplished.

4. In order to promote this mutual trust and goodwill, to obtain the thorough definition of relations to which I have referred, and to secure the manager's rightful authority and the men's loyal allegiance, it will, I think, be found extremely useful for the manager to meet in friendly conference a representative from each class of men in the service. Matters of mutual interest could be discussed, the *pros* and *cons* considered, and reasons given in all candour for this or that course which may be recommended—especially for the purpose of clearly showing the men that no undue advantage is sought to be taken of them, but that, on the contrary, their own, as well as the master's, interests are sought to be enhanced, and, in fact, that the proper ordering of a works conduces to the mutual and indissoluble interests of all.

5. I have not, so far, except very incidentally, referred to labour unions. The question will doubtless be asked—(and properly so) if such unions ought to be recognized; and, if recognized, to what extent. When they are rightly constituted, these unions are for the benefit of their members, and are designed to assist in securing good wages and other right conditions of work; and, so far as these objects are concerned, they are perfectly legitimate and worthy organizations, which intelligent men will soon perceive and take advantage of. Men must, under ordinary circumstances, be not only free to join such unions, but on the other hand, as has been recently said by the present Prime Minister, men must also be free not to join them. This view is also strongly urged by Mr. George Howell, M.P., who writes from the labour standpoint. He says: "The man (and the men) who seeks for the power to compel, violates the charter of Trade Unionism. . . . The men who deny the right to combine, and the men who deny the right of not combining, are equally wrong." There ought not to be any intrusion or obtrusion of the union into the works. It is there not a question of unionism or non-unionism, but of work and pay and other accepted conditions; and all men who faithfully discharge their duties and fulfil these conditions are equally entitled to consideration and protection.

Nor should this consideration and protection be confined to the works. Public order demands that in their homes, and in going to and from their work, their safety shall be secured. But how often have we seen that, when a dispute has arisen, and men have voluntarily left their work, those men who have willingly and gladly taken their places have not only been called foul names, and subjected to all manner of abuse, but they have received bodily ill-treatment, and their homes have been wrecked. This is called "picketing," and the use of moral suasion, forsooth! Such conduct, however, is an eternal disgrace to the British workman, and enough to condemn even a righteous cause. The weapons for such warfare are too often forged in the low beer-houses and drinking-shops which are so numerous in labour centres. Let all legitimate means be made use of to make known the truth as to any cause of dispute. But when "picketing" obstructs the public footpath, renders the streets unsafe for passers-by, seeks to prevent men from working where and when honest labour is provided which the "picketers" have more or less scornfully refused—when it consists in hurling paving-stones, bricks, lumps of coal, and bars and bolts of iron at the defenceless heads of men able and anxious to proceed on their way to work—then "picketing" ought to be treated as other misdemeanours are, and put down by the strong arm of the law; and shame upon the man who can be found to say one single word in approval of such dastardly conduct as this. It is satisfactory to find, as in London, Plymouth, Cardiff, and elsewhere, that this view of the case is finding expression in our Law Courts. Mr. Howell again says: "It is lamentable that this revival of an old and bad practice should have taken place; but it is gratifying to find that the use of force and violence is being discontinued."

I have noticed that certain disputes have recently arisen in consequence of the discharge of men. It surely need not be said that it is a blunder and a wrong for a man to be discharged simply and solely because he is a member of a trades union, and equally so if he is not a member, provided always that he is doing his work satisfactorily. But, on the other hand, it cannot be too strongly insisted upon that membership of a union does not exonerate a man from proper dismissal, or give him the right to do as he likes on the works. When the number of men is being reduced, the manager must exercise his power, and

dismiss without fear or favour; and certainly bad work or bad conduct must be dealt with in regard to all men alike. To insist otherwise, and in favour of union men, would deal a deadly blow at Trade Unionism.

6. I do not consider that it falls within the scope and intention of this paper to say more than a passing word in reference to the good effect which wise and kindly efforts for the promotion of thrift will have upon a steady and intelligent workman. The admirable "Report on Profit Sharing" recently issued by the Board of Trade, is worthy of most careful study.* It may be difficult to devise a scheme which shall apply equally well all round. But be sure of this, that the man who, in some form or another, has a share in the concern—whose interest therein grows and increases with his years of service, and delivers him from fear of the workhouse, and means comfort in old age—will think, and think twice, aye twenty times, before he throws away these advantages in a desperate struggle, the issue of which is doubtful, and may be disastrous, for a paltry questionable and temporary gain. Nor need such promotion of thrift necessitate a man's ceasing to be a member of a trade union, for the two things are not by any means incompatible. I very earnestly commend this subject of profit-sharing to the serious consideration of this meeting; and I suggest that some simple and well thought-out scheme might be formulated for general adoption by gas authorities throughout the country. Not that by any such scheme should any interference be sought with fair rates of pay and conditions of labour. Whether a man is thrifty or not, if he does his work well and earns his wages in full, he must be paid them. But if good conduct and good work can be so encouraged that an amount over and above, and apart from, his wages can be saved and placed to his credit, where it may grow, and increase, and be safe for a time of need, such an arrangement must have a good effect on the workmen, and be promotive of the interests of the employer.

7. The question of the formation of Boards of Conciliation or Arbitration has of late been much discussed; and many persons are hopeful of good results from them. Their object is most praiseworthy; but as to whether or not they will be of advantage depends much upon their constitution and the authority with which their decisions will be received by the disputants. A board, or a committee, or individuals, brought to the front or pushing themselves forward in the midst of the excitement of a strike, when the real matters in dispute are lost or obscured by surging passions, are not likely to command respect or to secure confidence; and therefore their decisions or suggestions will, as we have often seen, be disregarded. To do any real good, such a body must be permanent, although its members may from time to time change. It should be composed of members free from mere officialism, and yet practically acquainted with the conditions of labour and the rights and duties of capital. The masters and the workmen ought each to have a fair but not undue representation, and the addition of men who enjoy public confidence, and who are accustomed to deal with trade and business questions, would be of great advantage. The representatives of the disputants on either side must have the opportunity of fully and calmly stating their respective cases; and the Board must have the right of obtaining such other evidence as may be thought desirable. I am of opinion that a Board so constituted, whose decisions should be final and binding on both parties, would go far to settle disputes and prevent strikes. Therefore it is that I look with some degree of hope, if not of confidence, to the result of the labours of the Royal Commission which the Government has appointed; and certainly when such a Board is constituted, whether by Government or otherwise, that cause would be condemned beforehand which was sought to be promoted by a strike or a lock-out rather than by an appeal to such a body.

8. It has already been said that, in so far as labour unions exist for the promotion and protection of the interests of the workers, in the use of all legitimate and fair means for the attainment of these objects, the men are to be encouraged to join them, and commended for doing so. But the modern unions have greatly changed the methods of many past years, and have become decidedly aggressive, with the object not only of securing the interests of their members, but of preventing non-members from obtaining work, and also of breaking the power of, or altogether destroying, the capitalist. Even a cessation of the strike policy has been recently recommended for the present by a prominent leader, in order that preparation may be made for one gigantic struggle, in which the capitalist shall be destroyed, and from which labour shall rise triumphant. This being so, it has become an absolute necessity that gas authorities, as well as other employers, shall also avail themselves of their just and legal rights, and shall combine for the protection and promotion of their mutual interests as employers. Representatives of gas companies and local authorities owning gas-works, meeting in council, would be able to devise and carry out good, useful, and practical measures; and, in combination with other unions of employers in allied industries, would certainly present a strong resistance to any attack which may be made upon their rights and privileges. There are not wanting those who say that such a struggle is inevitable; that it is within measurable distance as to time; that it will be a struggle to the bitter end, and will decide the questions at issue between capital and labour for generations. It may be so. The spread of education, and the cultivation of more enlightened and kindly relationships, may tend to modify these dark and dire forebodings. Is the war inevitable, or is it even likely to arise? In either case, preparation must be made; and it becomes the paramount duty of employers, while doing all they reasonably can, to prevent the crisis arising, to entrench themselves in a position strong enough to resist attack, and to protect all those men who come to their help. This can only be done by combination—by union and federation, based on mutual confidence, on fair dealing, on justice, and on humanity.

Gentlemen, I have completed the task which I set before myself. We all deplore the evils resulting from strikes. They are needless, cruel, brutal, and certainly out of date. They cripple or ruin the capitalist, and bring dire distress and suffering to the workman and his family. Prosperous business concerns have, in many instances, been unable to stand the shock; and to-day there are men earning a scanty livelihood at unaccustomed work, or eating the paupers' dole of bread, who, before a strike, were earning good wages. The strikers have been sorely stricken; and many a respectable workman of a while ago has himself become a pauper or a "blackleg" of to-day. The suggestions I have made may not be such as will meet all the difficulties or overcome all the evils and prevent strikes. But they are presented in all sincerity; and an earnest discussion of the subject cannot but be helpful. The shortcomings of the paper can be more than compensated for by the wisdom shown in the discussion of the subject by the members of The Incorporated Gas Institute.

In conclusion, I may state as my opinion that it is desirable to establish Boards of Conciliation or Arbitration, or to adopt other means of preventing or settling labour disputes in connection with gas-works, without recourse being had to strikes or lock-outs; and that it would, I think, be a move in the right direction if the Council of the Institute took the subject into consideration, with the view of formulating a scheme to be recommended for adoption by gas authorities.

Discussion.

The PRESIDENT remarked that the members had had a very excellent, calm, and disinterested paper from Mr. Nickson on what was sometimes believed to be a very fiery subject. If they would accept the suggestions he had made, and discuss the paper in the same spirit as that in which he had treated it, they might arrive at some wise conclusion, and solve some of the difficulties which had troubled more than one.

Mr. C. A. CRAVEN (Dewsbury) said the paper contained many valuable reflections on past events, and gave some excellent hints as to the course to be adopted. One thing which would conduce to a good understanding between employers and employed was to treat the men kindly; and, while insisting on their doing a fair share of work, to let them see that there was a consideration for their welfare. He always endeavoured—and, so far, he had succeeded—to interpret in favour of the men, rather than of the employer, anything which might conduce to misunderstanding; and he thought that it was wise to do so. He fully

* This report was noticed in the JOURNAL for Feb. 10 last (p. 244).

recognized the right of the men to combine—in fact, it was absolutely necessary that they should do so, because they were not always fairly treated, and, he was sorry to say, had not been in the past. He did not refer specially to the gas industry; but there were trades in which the men were ground down and underpaid, and if they did not combine, they would scarcely be able to obtain the necessaries of life by the fruits of their labour. There had recently been very deplorable events in the district near which he resided; and Leeds had given an example which they ought to try and avoid. In that case there was not a spirit of trustfulness; for the men seemed to be afraid that they were not being fairly treated. He had noticed with considerable interest the remarks made by the President, in his opening address, with regard to some Corporations which forgot their true interest by introducing questions of party politics—a course which did not conduce to the interests of the ratepayers. In the Corporation which he had the honour to serve, they had Conservatives, Liberals, and he did not know what beside; but they did not allow their politics to interfere with their conduct of public business. When the Leeds business provoked a fight, it led to a lot of most foolish concessions. No doubt some of them were very desirable to make; but others were unwise. They started to fight with very good intentions, and gave in in the most miserable manner possible; so that the whole business was a melancholy *fiasco*. He had been fortunate enough to view the strike from afar. He had, however, been threatened, in a sense, with a strike—that was to say, he had a communication from one of those formidable leaders who conducted the Leeds strike—Mr. Cockayne—and another communication was addressed to the Chairman of the Gas Committee. The Committee had a meeting; he laid the matter entirely before them; and they came to a thorough understanding as to how much they ought to concede. He made certain recommendations; the matter was discussed; and it was then settled that he should meet the strike leaders unofficially. He accordingly had several interviews with them, and it resulted in very plain speaking on both sides—plain, but kindly; and at last they came to a decision, and the points which he told Mr. Cockayne they were willing to concede were almost entirely adhered to. The Union wanted to include the labourers in their demands; but he (Mr. Craven) pointed out that they could not do this, inasmuch as they were paying more than any other place in the neighbourhood. He gave full proof of this; and Mr. Cockayne acknowledged that he was perfectly satisfied that they had treated the men well. In the end, a final agreement was come to; and he was told by these gentlemen that, if the negotiations between the men and the masters in other works had been conducted on the same lines, many deplorable strikes would never have taken place. If any of the members were threatened with proceedings of this character, he should advise them to meet the men fairly. Trade Unionism was a fact; and it was a mistake to try to ignore it. It was one of the forces with which they had to deal; and it should be dealt with in the most reasonable way possible. He quite agreed with Mr. Nickson that right principles should be adhered to on both sides, and that there should be no disorder or violence. The principle on the part of the men should be to endeavour to be fully and fairly paid for their labour; and that, on the part of the employers, while looking for good work, they should treat their men with kindness throughout. Sometimes it was the custom to send away men who had spent the best of their days in working for the concern. He thought this was a wrong principle. When a man had served them faithfully during the greater part of his life, he should be considered, and kept on to do what work he could. This would be a great encouragement to other workmen to be faithful and reasonable.

Mr. D. Clarke (Ashton-under-Lyne) said that the paper was a very praiseworthy one; and he only wished the author had been at Ashton on the previous Tuesday to read it to a demonstration there. In that neighbourhood there was a strike of brick-setters and labourers; and four miles from Ashton a procession of men was started, which came from Ashton and Stalybridge, and turned out all the men where brick-setters and labourers were employed. Not satisfied with this, they proceeded to the Ashton Gas-Works, where they were making a tank, and called out all the men—navvies and everyone connected with it. On the day he had mentioned, there was a meeting of these men; and their language was very different from what it should have been, as described in the paper. Mr. Craven had spoken at some length as to the manner in which the men ought to be treated; and he (Mr. Clarke) was rather afraid, from his tone, that the impression would get abroad that managers of gas-works did not treat their men as they should do. The men availed themselves of these expressions, and said it was a partial admission. He thought they were all ready and anxious to do everything they could for those whom they employed. He had never seen any arbitrary conduct; but he had had a lot of difficulty with his men. At the same time, he was prepared to state that he had never asked them to do more than they had agreed to do. He only wanted them to properly perform their portion of the work; but the difficulty was to get them to do it. Persuasion was not good enough; and there were times when a manager could not enforce his orders, because he had not sufficient men at his command. They had a perfect right to see that their side of the agreement was carried out; but they did not want to make slaves of the men, or take any undue advantage. He was looking for a Board of Arbitration to be suggested by the Royal Commission—a Board which would have some power behind it; for the state of things under which they were now labouring was such that no one was really safe.

Mr. W. W. Hutchinson (Barnsley) congratulated Mr. Nickson on his paper, and all the more because those on the other side held their discussions in Committee. He noticed there was one cause of dispute not classified—viz., the right a master had exercised from time immemorial to discharge workmen whose services might not be required, on giving the legal notice applicable to such cases. Cases of this class would readily occur to the mind. He quite agreed with the definitions given under paragraphs 1, 2, 3, and 4. All were agreed that there ought to be no occasion for the application of so crude a way of settling matters as a strike, with all its loss and misery; and that nothing less than a species of infectious madness had seized the men of this and other countries, or they would surely use in this matter the common sense many of them undoubtedly possessed, and thus avoid the long and painful contests which had taken place from such trivial causes. He agreed that it was of the utmost importance that a spirit of trustfulness and mutual goodwill should be cultivated; at the same time he dissented from the concluding portion of paragraph No. 1—that the cultivation of friendly relations would go far to prevent or to settle disputes. Unfortunately, he was able to cite a very singular instance of the course recommended being pursued in a very full manner for some forty years, not only in generous payment as to wages, but in kindly and genuine good feeeling, with the most disappointing results. Very many of the men in question had experienced this treatment for periods varying from fifty down to twenty years, and had publicly acknowledged it; and yet, after all, they preferred listening to, and believing in, the advice of persons almost unknown, and totally irresponsible—ignoring, in the most complete and offensive way, the principle that "one good turn deserves another." One might have the clearest possible understanding with his men; but if they were under the spell of the professional agitator, and he willed it otherwise, the agreement, whether written or verbal, was thrown to the winds. It was quite true that there was no body of men having charge of works who had been such true friends to the men employed under them as the gas engineers of this country. He had little faith in the promotion of trust and goodwill, although, as he had already stated, he should practise it on principle. His experience was that managers might do all they could; but the men, under the influence of their so-called leaders, would throw them over at a word or a nod from them. It was stated that men must be free to join a Union; and, on the other hand, free not to join one. But it was obvious that the first was very much easier than the second; and he thought that the Prime Minister and Parliament would confer a signal blessing, not only on employers and the public, but most of all on the employed, if they so altered the law as to ensure that men should be free not to join a Union. The legal definition of "picketing" was often colourably evaded; and sometimes remorseless persecution was practised—the persons carrying it out being informed how near to the law they could sail and not be caught. He had very little

faith in the scheme of profit-sharing; and he could not help thinking that, in order to be right and just, it should be both profit and loss sharing. He further thought that it rather introduced a principle which might be fraught with complicated results. Why should a man be deprived of his expected proportion of profits because coal advanced 3s. or 4s. a ton and reduced those profits? The stokers and workers had nothing to do with this. On the other hand, engineers introduced improvements in the plant and machinery which sometimes succeeded and produced profit, while at other times it entailed considerable loss. Why should the men profit or lose thereby? Cases of this kind would, in the end, lead to men claiming a voice in the management of, without having any capital in, the concern; and he should prefer a definite wage, with perhaps a bonus added, irrespective of profits. The best way to prevent strikes was for the manager to deal directly with his men; and it should be made perfectly clear that he had full authority, and was supported by the governing body, whoever they might be—whether a Corporation, or a Board of Directors. If they declined to do this, then the best thing would be to refer those seeking to treat on behalf of the men to the heads of a federated Union of Gas Authorities, which should be formed, not only to protect the interests of the works, but the various managers from personal abuse of the vilest kind in the execution of their duty. When any dispute arose, they should first make sure that their cause was just, and then act with determination. The situation was very correctly represented by the motto of the City of Carlisle: "Be just, and fear not."

Mr. T. Duxbury (Darwen) said that, like Mr. Hutchinson, he had had some trouble with his men; but he had had a much more comfortable time since the strike than he had for two years previously. Mr. Craven stated that the men were perfectly satisfied with the settlement they had with him, and rather praised him for it; but this was generally the case if the men could get all they wanted.

Mr. Craven remarked that they did not get all they wanted.

Mr. Duxbury said he did not know if the members knew what the demands of the men were; but they were very wrong ones. He had in his possession a document, signed by the stokers, wherein they insisted upon various demands, one of which was that when they had done stoking, and were put to labouring work in the yard, they should have 2s. a week more than the ordinary labourers, although they were less able to do this work than the other men were. Mr. Nickson had read a very admirable paper; but some of the statements he had made were not quite practicable. He asserted that all strikes—at any rate, almost all of them—could be prevented. If, however, he carried his mind back to the Manchester and Salford strikes, he would see that the Salford men had nothing to do with the cause of the dispute at Manchester; but notwithstanding this, the Salford men all went out. It was not, with many of them, a question of justice; it was not even the Gas Workers' Union that did it. It was Socialist leaders in the town who were encouraging the men to go out. The week before his strike, he had almost twice the number of men applying for employment that he had working for him. These he could have put on, and stopped his own men; but he did not do so. At last it became a question whether or not he should have some of the men in reserve; but the strike leaders managed to get at the whole of them, and kept them all out of the way. This was one of their objects; and, by fair means or foul, they would prevent, if possible, any man entering works when there was trouble of this kind about. He would not deny the right of the men to combine; but he thought the masters or the managers ought to do so as well. They had been charged with entering into this combination at the present time; and at some meetings held at Darwen, it was publicly stated that gas managers met from time to time to devise schemes for keeping down wages, harassing the men, and so on, and that they were prepared to help each other in the various towns. Although managers did meet, as they all knew, they had no such organization as that suggested, and never had; but personally he thought they ought to have one, for mutual help in times of difficulty. So far as the men having a right not to join a Union was concerned, there was no doubt that the whole solidity of the Cotton Union was obtained from this principle—that non-union men could work side by side with the unionist, and not be interfered with in any way. Picketing ought to be done away with by law; and he believed the outcome of the present Royal Commission would be that they would have the Conspiracy and Protection of Property Act strengthened very materially, more particularly as regarded gas and other public works, where it was an absolute necessity that the supply should be kept up. It would be well to have Boards of Conciliation, because there would be something like a permanent body; but, under the present system, they found members of the "cloth" interfering. He thought if they would stick to their own profession, and leave commercial men (who knew something about business matters of this kind) alone, it would be far better. One of the great faults of a Union—and he was referring now not particularly to the Gas-Workers' Union—was that the authorities insisted on the same wages being paid to everyone. He had a case in Darwen where there was a plumber who was not worth 8½d. per hour, but was worth 6d. He worked a fortnight; and then he was told he could go, as he was not so strong or so good a workman as some of the other men. In the particular case, when the man was told that he could not be paid 8½d. an hour any longer, he positively sat down and cried. He personally was willing to take the 6d., but his club would not allow it; and, further than this, if he had taken the 6d., the rest of the men would have turned out. The poor fellow wished he had been a labourer. Cases of this kind of tyranny were constantly exercised; and the good workman did not get the benefit of his skill and ingenuity by being paid more than the poor workman. He (Mr. Duxbury) had had a lot of trouble in this way. No man was set to work without some of the leaders beginning at once to ask him if he was going to join their Union. The man would probably say he was not, as he did not want to pay anything, having enough to do to keep himself and his family. But he would be told that he must either join or that it would be made too "hot" for him. In fact, he was not allowed to perform his work properly unless he joined; so that men were actually compelled to pay to a Union in consequence of the treatment they received at the hands of the members. Some means ought to be devised whereby a man should be free to join or not as he thought fit. He (Mr. Duxbury) also found that the men, when agitating for more money and less work, were about as unreasonable as was possible. His Chairman told him they were prepared to pay the same rate of wages for the same amount of work as was done at Blackburn or Bolton, the neighbouring towns; but the men said they would not be guided by other places—they would fight for their own lives. They then offered the stokers an extra 3d., and the labourers 2d. a day; but they would not accept it—they would have their own exorbitant terms. The Chairman then put down his foot, and said they would not pay; and they were obliged to have a strike. It was utterly impossible in their case, unless they acceded to exorbitant demands, to avoid having one. He quite agreed that the Leeds *fiasco*, and similar cases, threw great difficulties in their way.

Alderman Miles (Bolton) said that he should probably not have risen to address the meeting had not the last speaker quoted a town in which he had the honour to reside, and said the authorities at Darwen would have been exceedingly pleased to pay the same wages as were paid by his near neighbours Blackburn and Bolton, and yet he could not bring his stokers to listen to reason. He (Alderman Miles) was happy to say that, although they had had some difficulties at Bolton, they did not find, notwithstanding that they were so near to Darwen, that they had such an uncontrollable mass of difficulties as Mr. Duxbury seemed to have experienced. He was disposed to follow the line Mr. Craven had taken—to cordially agree with Mr. Nickson when he said that he believed that, if kindly relations were maintained with the men under their control, there must be a corresponding advantage. It gave him the greatest possible pleasure to say that at Bolton, when they were threatened with troubles, they found nothing but the most conciliatory disposition on the part of the Chairman, the Secretary, and the Committee of the local Union. In Bolton the men had had more common sense than to join either any federated or any national Union; but they kept themselves to their own local organization. They felt that, in having a society of this description, if they appeared before the Bolton Gas Committee, they would have a body of men who would listen to them with kindness, and would

hear their arguments, and even their demands, with a conciliatory desire to do justice to those under their charge. He believed the cause of their overcoming their difficulties so easily at Bolton was because they had, in the Chairman, Secretary, and Committee of the Union, men who were anxious to show the Committee that they desired to work in peace and harmony, and to ask for nothing but what was reasonable. They had, therefore, very little difficulty in coming to conclusions which were mutually advantageous. He was a great believer in making the men feel that their employers had their interests at heart, and that whatever they asked for in a reasonable way should be loyally considered, and, if possible, granted. He verily believed that if these conditions were more generally observed—though he did not wish to assume that there was any body of men, either Directors or Committees, who desired to grind down the men, and put them in an unenviable position—if they cultivated a spirit of this kind, the relations between employers and employed would be even better than they were at the present time.

Mr. J. R. Smith (Padiham) had resided all his life within a few miles of one of the centres of the cotton industry, and had had opportunities of observing the progress which the Cotton Union had made since it was first established. One feature had been very pleasant, and that was the great difference between the action of the masters towards the men now as compared with what was the case about thirty years ago. He remembered the time when it was almost impossible for the men to obtain an interview with the masters; and if one were granted, the probabilities were that the men's reception would be anything but polite. Now, however, the Union was properly recognized, and interviews between its representatives and the masters were of frequent occurrence; and in most instances any little friction which might have arisen was settled quickly and amicably. It seemed to him that the gas interest was passing through a similar phase. He congratulated the reader of the paper on the liberality he had displayed in treating the subject, though he rather seemed to deal with general principles. Most of the difficulties in question arose in connection with large works. He represented small works; but even in such cases most of them had had some troubles to contend with. At the beginning of the season of 1889, he had an application from the stokers for an advance of 6d. a day, which was a considerable demand. He talked the matter over with the men, and they seemed to be disinclined to look at anything else than the 6d.; so he said they had better go before the Committee. Two of them did so. The result was that both sides were satisfied, and the thing ended in a simple equalization of the rates of pay at a certain price per ton; and they had gone on very amicably ever since. He agreed with Mr. Craven that it required great wisdom on the part alike of men, managers, and committees in dealing with these questions; and wherever they heard of a case being settled amicably, he thought it reflected credit on all parties concerned.

The President remarked that a suggestion had been made to him that persons who wished to take part in the discussion, which ought now to come to a close, might send in to the Secretary such suggestions as they thought desirable; and, if at all possible, they should be incorporated in the Transactions.

Mr. J. West (Manchester) thought that common sense, kindness of heart, and good feeling to all men, had guided the discussion so far; but, like Mr. Clarke, he thought it must not be assumed that gas managers, engineers, and directors of gas companies had been harsh in their treatment of those in their service. He had been connected with gas-works for upwards of thirty years; and he was pleased to say that, during the whole of this time, there was goodwill amongst the men with whom he had come in contact. Whenever any application was made by the men, when he had an opportunity of disposing of it himself he, as a rule, did it in favour of the men. There was a great deal in what Mr. Nickson said about having the matter settled at once; and, if one could not do it oneself, calling the Committee together directly, and laying it before them. The men should not be allowed to remain in suspense; but the whole thing should be placed before the Committee. Let them talk the matter over, and see if they could not come to some reasonable understanding. This was the old practice; and it went on until very recently. If strikes commenced, some managers were able to settle them; but possibly they were then more easily adjustible. Perhaps the men had not so many "firebrands" amongst them—not so many leaders. One of the great difficulties now was to know who was the authorized leader, because there were bogus leaders setting themselves up here and there; and one did not know whether or not they had the authority of the leaders of the Union in London. Take the case of the South Metropolitan Gas Company. They knew that the men employed by that Company had been treated for the last thirty or forty years with as great consideration as at any gas-works in the kingdom; and yet, with all this kindness and consideration, the Company did not avoid a strike. What was the case at Manchester? The men met there, and asked for certain things, and the Gas Committee gave them everything, or nearly everything, they asked for. They granted them the eight-hour system, he believed with the same money as for ten hours; and the men settled down to work happily and contented. Then someone came in to disturb them; and they said: "No, we will not have these non-union men amongst us; they must all be union men." Mr. Nickson had rightly said that Englishmen should be at liberty to do as they pleased—either to join a Union or act as free men and not join. This was what caused the strike at Manchester. The men had all they asked for; and it only made them more tyrannical than ever. Where did the "brotherly love and kindness" come in? These men did in some cases 50 per cent. less work, and received the same pay; and after they had it, they said they must kick the other men out unless they too joined their Union. This was the cause of the strike in Manchester; and it was exactly the same in many other places. He agreed with what Mr. Craven and Alderman Miles had said, that they should use every possible means to talk the matter over with the men, and discuss it fairly, and decide quickly what should be done. The question of profit-sharing in gas-works might, perhaps, be carried out; but it would be very difficult indeed. As one speaker had remarked, there were the losses. If one could state what would be the cost of every department, one might lay down a basis; but, in view of all the changes that took place, he did not know how it was to be brought about. He should like to see some means employed of giving the men an interest in their work, by allowing them a bonus, or inducing them to save their money, instead of spending at the beerhouse 35s. out of the 36s. they earned. These schemes were very nice indeed; but they were hard to carry out. He was connected with other works besides gas-works; and he had been always most considerate to his men. He had always advocated a good salary for himself, and good wages for his men; and they paid them in Manchester in the engineering trade more, perhaps, than in other places. They did not very well like this, because sometimes they had to compete with their neighbours, and thought it would be fairer if there could be a kind of communism, so that all should pay the same rate. Until recently he had avoided joining the Masters' Union, because he claimed and desired to act for himself or his brother Directors, and had always wished to have the men before them, and say to them: "How can we settle this matter? Say what you want, and I will consider it." Then when the men were told what had been decided, they would say: "We cannot settle it ourselves; we must see our friends, the Union." He had never acknowledged unionism or non-unionism. The Manager had instructions not to ask anybody what he was, or where he came from, so long as he did his work properly. They did not care whether he went to church or chapel, or what his politics were, so that he could do his work. But they could not manage these men as they used to do; they could not deal with them individually; they could not decide what they would do without consulting other people. He had an example of this only a few months previously. In a certain department the men went to the Manager and asked for an advance; saying that some other people in the district had given it. The Manager said he would inquire; and if the advance had been given, they would do the same. But the Managing-Director was away, and he could only give a decision when he had returned. They said: "No; you must decide at once." He replied that he could not do so. Then the men said: "We must leave the works;" and they left. They would not allow time for the terms to be even considered. They set up a system

of picketing; and when the Directors did meet later on, they said that, as the men would not wait for the matter to be inquired into, whatever they decided to give would not be given to them. Other men could come in; and if they determined to grant the advance, they would give it to others. They ascertained that a few people in the district had allowed it, but the majority had not. The advance had really been granted months previously; so that the men misrepresented the facts. Other men came in, and he granted them the advance. But what did the others do? They picketed the place for twelve weeks, and got man after man out of the works. Where was the "kindness and consideration" to come in in such a case? One could not conciliate such men. They were only a few—about a dozen—and they went round to the various engineering works, and obtained from 7s. to 8s. a week more than they did when they were at their employment. It paid them to keep out, and to pay men to come out of the works. How were they to get over these difficulties? He confessed he did not know; and it was this that had forced him to join the Masters' Union in Manchester. When the subject came up a short time ago in connection with the 53-hour question, he said he would rather give a little more money. What was the good of the additional hour to them? There would have been some sense in it if they had asked for an advance in wages. They said they had instructions; but 95 per cent. of the whole of them did not care about the thing, and regretted that it had cropped up. The great majority of the men were willing to arrange amicably; but they were not allowed. It might be different with gas companies; but it was necessary, if one side had a right to combine, that both sides should say that, if circumstances required it, they could meet each other and fight these things out.

Mr. W. A Valon (Ramsgate) said that he would take advantage of the President's offer, and communicate to the Secretary something on the question under consideration. He would only then say that he deprecated very much the belligerent tone which appeared to prevail throughout the meeting. He did not like it to go forward that they were antagonistic to the men, which he was afraid would be the impression conveyed by portions of the discussion that morning.

Mr. W. Ford (Stockton) said he should not have spoken except for what Mr. Valon had just stated—that he feared the notion would go abroad that the men and themselves were antagonistic. He had the opposite view. His men and himself, and his Committee, had been almost as one; but the Union outside came in and disturbed them, and had made his position almost unbearable for the last two years. He believed a demonstration was to be held in Stockton to hold him up to ridicule, because he had been the means of advancing the stokers' wages from 24s. to 37s. 6d. per week. Yet the Union were not content to allow him to do his business in his own way. It was not true that gas managers and their men could not agree; for he had been upwards of 30 years a gas manager, and had never had a difficulty with his men.

Mr. S. W. Durkin (Southampton) also said he would send his remarks to the Secretary, and would only mention that they had now a Free Labour Association established in Southampton, which had now been working very nicely for more than twelve months.

Mr. D. Irving (Bristol) and another member also expressed their intention later on to send in their remarks in writing.

The President said he was sorry that so interesting a discussion would have to be curtailed. Perhaps, however, it was wise that it should be; and any gentlemen who had not promised to do so, would still be at liberty to send in any communications which might be helpful in the solution of what was really a very important question.

Mr. Nickson said that there was no necessity for him to make any lengthened reply. He was very pleased with the manner in which his paper had been received. There were a great number of very ingenious gentlemen present—not the least being Mr. West; and if he would kindly set his mind to the solution of one or two suggestions, such as profit and loss sharing, to which allusion had been made, something might arise out of it. Of course, he (Mr. Nickson) had dealt with the subject entirely on different principles. If he had given the history of the strike in Manchester, it might have been interesting; but it would have applied only to Manchester, and that it would not be of the same general interest as a paper on the subject he had chosen was manifest. The history of that strike was written in very lengthy documents which might some day see the light. Perhaps fifty years hence the Editor of the Journal of Gas Lighting might be glad to avail himself of the MS. history of the strike, which they possessed in the safe at Manchester. They were always pleased to give to any gas company who applied to them the fullest and clearest information they could in reference to the manner in which they went through that strike; and he had a large number of letters, many of them expressing thanks for the particulars which had been given. He need not say that they were at all times happy to reply to inquiries of this sort which would help their fellow-labourers in this cause. He concluded by saying that, in the event of any communications being sent in by members which contained intelligent comments on the paper, he hoped he might have the opportunity of seeing them, and, if need be, of adding a few words in reference thereto.

The President assured Mr. Nickson that this opportunity should be given to him.

Mr. J. M'Gilchrist (Dumbarton) then read the following paper on

COAL STOREAGE.

The theme on which I am to speak is "Coal Storeage"—a subject which in the past has not received from Gas Associations the consideration it undoubtedly deserves, but which in the future, both from its own inherent importance and the many risks arising to gas making from industrial disturbances, must demand attention. Mr. Charles Nickson has to-day favoured the Institute with a paper on gas workers' strikes; but if he could, along with the Institute, settle the larger question of strikes in other departments of labour as well as those connected with gas workers, it might be unnecessary for me to discuss this question. It seems to me, judging from past and present experience, that there is every likelihood of strikes becoming more numerous in the future than they have been in the past. It has been said that strikes will not cease from troubling the labour and commercial interests of the land until "the lamb and the lion lie down together;" but I am afraid that this happy and blissful period will only come when the lamb has disappeared in the lion.

With regard to the question of coal storeage, I do not know that there is any specific rule for the quantity of coal to be stored in proportion to the annual make of gas; but if such a rule exists, I am afraid it is "more honoured in the breach than the observance." I know of gas-works—large works—where there is practically no provision made for the storeage of coal; and I know of other gas-works having storeage for at least one year's make of gas. The difference between these two cases gives a wide range; and I am afraid the instances where the storeage capacity is limited are much more numerous than those where the manager can lay in a large supply, and can say with a contented mind during a strike: "Soul, take thine ease, for am I not bountifully—yea, most bountifully—supplied, and the people verily shall have light?"

We have rules for gas storeage in proportion to the maximum make of gas; why should we not have a rule for coal storeage? I hold that no gas-works are complete with less storeage accommodation than would maintain a supply for three months, calculated for the winter consumption of gas. I contend that, if my idea were generally adopted, it would prove, not only economical, but would go far to place gas companies and gas corporations above the whims and caprices of Trade Union leaders, and would enable them to give a constant and efficient supply of gas during any temporary labour dispute.

There are three classes of strikes affecting the gas industry. These may be put down in logical sequence as gas workers', positive; railway, comparative; and miners', superlative. The first of these classes of strikes is, no doubt, troublesome; and, in many cases, most expensive to defeat. But we have been taught by the South Metropolitan Gas Company how the battle can be fought and won. We, as gas managers, owe Mr. George Livesey, Mr. Nickson, Mr. Hutchinson, and others, a deep debt of gratitude for the manly way in which they fought the battle of the gas industry against the Gas Workers' Union. The second class of strikes—viz., railway—affect the gas industry even more than the first, but in a less

direct way; because, with insufficient coal storeage, unless at enormous expense, it is almost impossible to maintain a constant and satisfactory supply of gas. In Scotland, during the railway strike last winter, the purveyors of gaslight were at their wits' end to give even an indifferent supply; and this was only accomplished with enormous mental worry and money expenditure. Three months' coal storeage would have saved all this; because the strike lasted only for six weeks. In England, too, the same conditions prevailed. A friend in a good-sized English town, writing to me on the subject of my paper, says: "For my own part, I can scarcely find words to express the anxiety that I endured last winter in consequence of not having a coal-store. With the exception of being able to store about 600 tons around the retort-house, I was practically dependent upon regular daily supplies. The stock of coal may be kept intact during summer; but in winter it varies from day to day, and especially during any holidays the miners may indulge in. On more than one occasion we had not sufficient coal in stock to last 24 hours." Contractors, my friend goes on to say, were pushed for delivery. But they were unable to respond; and his Committee were compelled to purchase a quantity of coal from other sources at an increased cost of 35 per cent. over their then contract rates. Such is one example of a works without coal storeage—perhaps rather an extreme case. But had my friend had ample coal storeage, such as he is about to get—and, I may add, "he won't be happy till he gets it"—with what peace of mind both he and his Committee might have pursued their labours. As to the third class of strikes—viz., those of miners—although the gas workers and the railway people might be anxious to assist in maintaining the gas supply, they would be powerless, because if the coal is not raised from the earth they might join that deplorable band of winter gardeners, the refrain of whose ditty is, "We've got no work to do."

Perhaps the greatest objection to supply sufficient coal storeage is the cost it would entail. I now propose to show that ample coal storeage is not a drag upon the resources of a gas company. Indeed, I believe that in most cases it could be shown to be a clear profit, altogether apart from other advantages. Say that the average cost of coal storeage amounted to 1s. 6d. per cubic foot of space, and giving 44 cubic feet to the ton, we get £3 6s. of capital charge per ton of coal. With this space occupied twice in a year, we get £1 13s. as the capital charge per ton. I now proceed to point out the economies that compensate for this capital outlay. In the first place, let me remark that, to ensure an ample supply in winter, the coal-master must bring his coal outside at the pits, which, of course, is charged on the cost of the coal. This will be at least 6d. per ton. Again, by its being exposed to the atmosphere, coal undergoes deterioration in a remarkable manner, dependent upon its composition. This deterioration, together with the dross, may be put down at 1s. 3d. per ton. To this sum it would only be fair to add 1s. for the disadvantages arising from the carbonization of wet coal. This makes a total, under these three heads, of 2s. 9d. per ton—a saving sufficient, under almost any circumstances, to provide ample coal storeage. Over and above this large amount, I believe another saving could be effected. If companies were to take their supplies of coal other than in the winter season, when railways are pressed with the maximum traffic, the railway companies would make concessions under the head of carriage, which should also be put to the credit of economies.

In addition to all these pecuniary advantages, no one can over-estimate the benefits of carbonizing coal when it is comparatively speaking dry. Indeed, I think one of the greatest blots in our system of gas manufacture is the unscientific manner in which we often treat the coal previous to carbonization. It sometimes arrives wet at the gas-works; and in this unsatisfactory condition it is frequently thrown into the retorts. The late Dr. Wallace, of Glasgow, in the year 1878, when testing undried and dried coal, found that the latter not only gave a higher illuminating power, but also a much greater yield per ton—equal to fully 10 per cent. The increased sperm value of coal when properly dried is somewhat extraordinary. And here I may parenthetically observe that, so great are the advantages of having the moisture—other than that of composition—extracted from the coal previous to carbonization, that I believe it would recoup the outlay of constructing a flue from the retort-bench, under the coal-stores, to the chimney-stack, so as to attain the end in view. For these and other reasons, to which I need not specifically allude, I think I have demonstrated that no gas-works can be in a complete or satisfactory condition without ample storeage accommodation.

In these days of the New Trades Unionism, it is imperative that gas companies should have sufficient coal storeage. We can all remember the time when coal-masters "binged" coal at the pit-heads to meet the winter requirements of gas manufactories. Under modern ideas of Trades Unionism, the coal-master cannot store coal as he used to do; because, as soon as a few tons appear in store at the pit's mouth, the miners go upon holiday. I know of four collieries in Lanarkshire where the miners acted as I have described.

Such a state of affairs implies a hand-to-mouth arrangement which cannot be pleasant to anyone who undertakes to give the public a sufficient and constant supply of gas. It simply means that if this were the rule throughout the country—and I fear it is fast becoming the rule—the consumption of coal being so much greater in the winter than in the summer months, when the winter arrives there will not be a stock of coal above ground to enable gas manufacturers to maintain a constant supply. This may be all good enough for the miner, who, no doubt, within certain limits, is justified in looking after his own interest; but it is a state of matters calculated to create some concern in the minds of gas managers and their constituents.

Can anyone imagine conditions more appalling than a gas-works with a short supply of coal during the dark months of winter? Were companies throughout the United Kingdom subject to such a condition for even one night, the unfortunate results to life and property may be better imagined than described. The fact is, we must have coal; and the only safe way to ensure this is to have the surplus coal which is raised from the earth in the summer season, stored at our works to meet winter requirements. If we could attain the end I have in view, the coal-master would be relieved of much responsibility, gas companies would be greatly benefited, and the public would have no cause to fear an interruption in the supply of artificial light.

Some may object that, by storing coal for the period I have indicated, extra cost would be incurred by the coal-master charging interest. But I have it on the authority of certain coal-masters that they would be only too glad to increase the term of credit on coal so stored. This I consider no great sacrifice on their part, because they never make bad debts in dealing with gas companies and corporations.

In conclusion, I trust I have laid this subject before you in such a way as may elicit a free and full expression of opinion. If this Institute gives a strong expression of opinion as to the coal storeage required at gas-works, I believe many suffering at the present time from short storeage would easily get the amount they require. In a word, I believe that ample coal storeage will conduce to the peace of mind of gas managers, and at the same time keep the miners and other workers in check. The onus of maintaining a supply of coal during troubled times should not rest on the shoulders of coal-masters and railway companies. The proprietors of gas undertakings should bear a fair share of the responsibility; and I hold that the best way to accomplish this is by the provision of ample storeage.

Discussion.

Mr. R. MITCHELL (Edinburgh) said that during the last railway strike in Edinburgh, they were put to very great inconvenience indeed for want of a supply of coal. Their works only occupied an area of about 4¼ acres; and on this space last year, they made nearly 1000 million cubic feet of gas. So that there was not much room left for coal storeage. At the beginning of the season, they had a stock of nearly 9000 tons of coal, with daily deliveries coming in; and they were working about 500 tons a day. They found themselves gradually coming down, until one morning, instead of having a day's supply of coal, they only had 300 tons in stock to keep the city lighted. He called upon the late Mr. Walker, the Manager of the North British Railway Company, and put the whole case before him but he said he could do nothing. Ultimately, however, he said that he would lend them an engine if they could

manage with it; and by this means they overcame the difficulty. They had to cart the coal nearly a mile from the Caledonian Station at the west end of the city. They had also to cart it from Leith, where they had four steamer-loads of English coal. But besides this there was the difficulty of getting the lime, and taking away the refuse coke, ashes, and other things. So that, altogether they were employing 4496 carts, owing to the inconvenience caused by the railway strike. This might have been obviated if they had had more room for storeage. If the Gas Commissioners had been as prudent as the Directors of the old Gas Company had been, they would have had from 15,000 to 20,000 tons of coal within four miles of the works. The old Company were always afraid of something of this kind occurring; and they were never without fro m 12,000 to 15,000 tons of coal lying within fairly easy reach. The Corporation, however, thought that going to an expense of this kind was bordering on speculation, into which they were not allowed to enter; being simply entrusted with the concern, to carry it on for the benefit of the public. One of the best means of securing the comfort of a gas manager was to let him have ample storeage room for coals. He did not go so far as Mr. M'Gilchrist; but properly constructed works should have in stock at least one month's coal, which in Edinburgh would be something like 14,000 tons. If corporations and gas companies were to give the slightest consideration to the feelings of their managers, they would make such provision; for few people had any idea of the anxiety felt by a manager when he saw his coal rapidly decreasing, and no more coming in.

Mr. J. Carter (Lincoln) said that this question had a close personal interest for those who were in charge of gas undertakings; but there was a more general aspect of the case which seemed of importance. Although there might be some points in the paper with which they would not all agree, on the question of ample storeage he believed they would be pretty well in accord; the only difference of opinion would arise on the definition of the term "ample." Mr. Mitchell had just stated that the minimum should be one month's supply; and he thought that many would be comparatively safe with this amount of storeage. But they would be all the safer if they had the maximum supply which Mr. M'Gilchrist mentioned. At any rate, from his experience of the last few years, unless they had from six weeks' to two months' coal in store, they could hardly without some anxiety, face the coming winter, under present conditions of the labour market. For many years they had witnessed a great development in the consumption of gas for trade and manufacturing purposes; and they were looking to still further progress in this direction. But if this were to be experienced, it must be made absolutely clear to those for whose support they looked, that there should be a guaranteed and absolutely regular uninterrupted supply; and to afford this, ample storeage room for coal must be provided.

Mr. D. Bruce Peebles said he always felt he was to some extent intruding when he rose to speak on what was pre-eminently a gas manager's question; but there had been two excellent papers read that day, appealing to all who had to do in any way with trade—the last one being an admirable continuation of the first. The key to both lay in the word "strike." What he wished to comment upon was the suggestion made by Mr. M'Gilchrist, to pass a flue under the coal-store for the purpose of drying the coal. A good many years ago, he had the pleasure of going through the Toronto Gas-Works, when the Manager pointed out to him what he thought was the extraordinary phenomenon of spontaneous combustion which had been going on in certain parts of the coal-store. It occurred to him that, though possibly it might be useful to have a flue going through the coal, there would be an element of danger in it. In the Toronto case, owing to absence of oxygen, though the coal was all charred in different parts, it never burst into flame. Such kinds of coal were often found in the Ayr district, where it was called "burnt coal;" evidently showing that combustion had been in progress for a considerable time. He would emphasize what was stated by one speaker—that the relations between masters and men were very much changed.

Mr. Nickson said he did not believe Mr. M'Gilchrist intended to suggest—at any rate, he should not like it to go forth—that the Manchester strike originated in antagonism to the Union; because it did not.

Mr. C. A. Craven (Dewsbury) said he did not think it possible to lay down any rule as to the amount of storeage required for all gas-works. In some cases, like his own, where the works were at a very small distance from the collieries, there were facilities for getting the coal at a short notice; and they did not require so large a stock as in other cases. Up to last year, the storeage at their works, where they carbonized about 20,000 tons of coal a year, was only about a fortnight's supply for the maximum make. But this was found much too small; and since then storeage had been arranged for which would give an extra month or six weeks' supply, which he believed would be ample for him, though it might not serve in other places. He did not agree with the author of the paper as to the desirability of putting a flue underneath the store; because, from his experience in South America, where he lost a portion of his coal from spontaneous combustion, he was sure with such a flue, especially if the coal were stored in a partially wet condition, it would only hasten an event which all would deplore.

Mr. T. Duxbury (Darwen) said that formerly they had at his works only storeage of coal for three to three and a half days' supply of gas. At the present time, however, they had from one-fifth to one-sixth of the total year's consumption. So that he was in a happy position in this respect; and during the last colliery strike, he was able to send some coal to a neighbouring gas-works within two or three days of their stock being exhausted. He had some difficulty in persuading his Board to provide ample storeage; and it would be a great inducement to boards of directors and committees if the colliery proprietors themselves would hold out an inducement by offering the coal at a slight reduction if a large quantity were taken in the summer time. He found, however, that it was rather the reverse. He did not think that they obtained any benefit from the colliery people, but that they kept it themselves. He inquired whether they could have any advantage by taking in the summer time from one-fifth to one-sixth of the year's quantity; but, out of three colliery owners he saw, not one would make any allowance. If they could see their way to do so, it would show to their directors and gas committees that it was to their interest to provide ample storeage.

Mr. D. Vass (Portobello) said he had one month's stock of coal at the beginning of the railway strike, and during the six weeks it lasted he got in about another fortnight's supply; but as everybody was waiting expecting the strike to close every day, they allowed themselves at last to run almost threadbare. At Portobello they were only two miles from the collieries; and if they could have had deliveries by road, they could have supplied themselves. But everyone in the locality was doing the very same thing; so that the rate of cartage went up tremendously. The colliery companies also, with whom they had no contracts, asked a higher price for coal during the strike; and there were other inconveniences. With regard to the flue which had been suggested, he might mention that about a month ago he had in a quantity of small coal, which, as it appeared to be damp, was placed against the wall of the retort-house; and, as there was a boiler on the other side, in a few days it began to give off smoke, and had to be removed. The wall would be about the thickness of a flue such as the author proposed; and he therefore thought it would be very dangerous to attempt to dry coal in the way mentioned.

Mr. W. W. Hutchinson (Barnsley) asked if Mr. M'Gilchrist could give the meeting the benefit of his experience on a point which he had not mentioned—namely, the loss incurred by the stacking of coal under cover and out in the open. He understood the author to say that ample storeage would be a source of profit; but he should rather describe it as incurring a necessary loss. As to the definition of the term "ample," although the town from which he came was in the centre of a splendid coal-field, he did not think he should be safe unless they had two months' supply of the maximum make. With regard to varying the price for winter and summer, his experience was that, while colliery owners were willing to entertain the idea of a somewhat lower price—say, 4d. or 6d. per ton—in the summer two years ago, they would not do so now, because interested parties always took care to put gas-works in the forefront of the battle, and say that their owners ought to pay handsomely for their coal. At Barnsley they had a heap of about 800 tons of small coal stacked in the open

air for about six months, and had not suffered any inconvenience from spontaneous combustion. But no doubt the coal deteriorated; and he had heard it stated that there was a loss of no less than 15 per cent. from outside storeage, though he had no positive proof of it. His experience was that, even if the coal did not come in wet, it was often wetted by the stokers.

Mr. T. O. Paterson (Birkenhead) said he had this year tried the experiment of asking for a reduction on the summer deliveries of coal if he took a large quantity in July, August, and September. In several instances he had offers of a concession; and in one case he accepted it. He did not think 6d. a ton would really cover the extra cost, including the deterioration by exposure for a long period. He was fairly situated, geographically speaking. His consumption was 40,000 tons of coal per annum; and he had accommodation for about 6000 tons.

Mr. J. West (Manchester) considered it was a great advantage to have good storeage; but, of course, the relative capacity of the store in connection with the size of the works depended on the locality. In the South, where they were compelled to rely on seaborne coal, they had storeage for a longer period than in the North or the Midlands, where they were in close proximity to the coal-fields. Some twenty years ago, during the time of the coal famine in the South, through having large stores, and a good supply of coal being kept there, the gas consumers were well served, while his brethren in the North had to pay large amounts to get coal of any sort into their works. He happened to be at Maidstone at the time, and weathered the storm very well; and consequently he saved considerably. Mr. Syms, of Rochester, he believed, also passed well through it, owing to having a large stock of coal on his works. By having a store, gas managers guarded against strikes—not of their own workmen alone, but also of railway people; and in the South they had to guard against the winds and waves, and all that sort of thing. It likewise gave them the opportunity of getting in a supply of coal in the summer; and his experience had been that they obtained a very great advantage in the matter of price. In Manchester they always made a rule of filling the stores during the summer months; for he did not know how they could get in the coal in the winter season. No doubt they obtained a considerable reduction by getting from 80,000 to 90,000 tons of cannel and coal stored, which would last for their maximum requirements over seven or eight weeks. He had had bitter experience of the danger of warming up coal. At Hastings there was a store containing about 1800 tons of coal, which was put on one side for some months as a reserve. One day they saw fumes arising; and they found that the whole of the coal was in a state of ferment. The origin of this was a flue from a boiler, which ran alongside the edge of the store. The consequence was that they had to shift about 1500 tons of coal; and what they did remove was of very little value. It was Newcastle coal; perhaps cannel would not act in the same way. He would recommend managers to act as they did in Manchester, and as he believed Mr. Ogden did at Blackburn. He had there a large coal-store, and consequently found himself in a state of security. This plan was being very largely adopted in the South, both at Beckton and at the works of the South Metropolitan Company. No doubt there was a certain loss by deterioration; but this was recouped in various ways.

Alderman Miles (Bolton) expressed the opinion that, after last winter's experience, engineers of gas-works would pay a great deal more attention to the question of coal storeage than they had hitherto done. He said that at Bolton they had not been in the habit of storing coal largely; but last winter they made an exception to the rule, and found it of great advantage to the Gas Department, and an immense comfort to their Engineer. His experience did not agree with Mr. Duxbury's as to colliery proprietors being indisposed to make any concession to gas makers for taking large quantities of coal in the summer. They had had a direct offer from a large contractor who was willing to make an allowance of 6d. a ton if they would have reasonably large quantities in the warm weather. Beyond all the advantages stated by the author of having a coal-store, there was one which had been overlooked, and that was the question of the quality of the coal delivered in the summer as compared with that sent in in large quantities in the winter. His experience had been that when gas suppliers were making tremendous demands upon colliery proprietors, they had a correspondingly inferior description of coal. Previous to last winter, they stored at Bolton something like 7000 to 8000 tons of coal; and the quality of the supply they received during the summer fully warranted them, in his opinion, in having this large quantity. Notwithstanding all their provision last winter, they were reduced, on one or two occasions, to something like 24 hours' supply of coal, or even less, which was rather a serious matter. He did not know that he could quite agree that three months' storeage was necessary; he should rather have been inclined to put it down at two months. This, however, was a matter of detail for gas engineers and managers to work out for themselves. It could not be denied that there was great need for more attention to be paid to this subject. They would all be glad to have supplies of coal direct from the pit mouth, if they could get them; but this being impossible, their duty was to put in a good stock, so as to be relieved of any difficulty in the winter.

Mr. S. R. Ogden (Blackburn) said that last winter it had been a source of great trouble to him to get coal—not on account of any strike, but owing to the shortcomings of the Lancashire and Yorkshire Railway Company. He had in stock 8000 to 10,000 tons of coal and cannel, which kept gradually going down until, in the week before Christmas, he had only 24 hours' stock in hand. He failed to get a supply; but through the kindness of Mr. Duxbury, who let him have coal which one colliery were under contract to send to Darwen, he was able to get out of his difficulty. This showed the great advantage to managers of gas-works of having two or three months' stock of coal in hand.

Mr. M'Gilchrist, in reply, said he could not but feel flattered at the way the question raised in his paper had been discussed. It was not a paper on which the members would all agree; but it was no use bringing before such a meeting as that papers on which they were all at one. The fact was that on some points he had perhaps exaggerated his own view in order that there should be a discussion. Mr. Mitchell's only difference of opinion was on the question of degree. Mr. Carter had touched upon a point which, if he had thought of it previously, he might have introduced into his paper—namely, seeing that gas managers were supplying so much gas for power in different works, it would not be merely loss of light, but loss of labour which would have to be considered in any stoppage; and that while possibly they might overcome the one difficulty with a penny dip candle or a paraffin lamp, there would be no way of getting over the other. Mr. Nickson kindly pointed out that the difficulty experienced in the Manchester case did not arise from opposition to Trades Unionism. But, unfortunately, it was the Union that brought the difficulty on the Corporation; and this was very much the same thing. As he had stated, they must look in the face the fact that there would be more strikes. The men were banding themselves together; and an altogether different set of circumstances existed from what obtained in the past. With regard to the flue, he was referring more particularly to cannel coal; and was not thinking of the dross which was used in England. He had known some coal which was exposed outside for six months, and lost 50 per cent. in value. It depended very much on the way in which the coal was deposited. The sum he gave—one-third—was probably an under-estimate. He was glad to hear that Mr. Paterson and others obtained concessions for summer deliveries. Mr. West had brought forward a very strong argument in favour of coal storeage—that when managers got into difficulties, there was not only the extra price they had to pay, but they received very different and inferior coal. During the last railway strike, the colliery proprietors were getting rid of all the rubbish about their places at three or four times the contract price. There were a good many other instances, such as those referred to by Alderman Miles and Mr. Ogden, which would take up too much time to deal with at length. He would only make one further remark—that they must have coal storeage; and whether it paid or did not pay, was a secondary question. He thought it would not, when he saw the miners and miners' agents going all over the country and selecting collieries supplying coal, and preventing the miners from raising sufficient to maintain the quantity during the whole year. Knowing that when it came to a winter's day they must have coal no matter

what the price was, it was evident that, if they did not raise their hands to assist themselves, they would some day be in a lamentable plight.

Mr. T. N. Ritson, Assoc. M. Inst. C.E. (Jersey), read the last paper, entitled—

THE DISPOSAL OF SULPHATE OF AMMONIA LOCALLY: EXPERIENCE IN JERSEY.

In the Journal of Gas Lighting for March 8, 1887, will be found an article entitled "The Distribution of Sulphate," in which the following suggestions are set forth:—

> Every gas company must form the centre of an organization for propagating a knowledge of the advantages of sulphate. . . . Country agricultural societies, and even parish clubs, where such exist, should be made use of by the offer of prizes for the best results in cultivation from the employment of sulphate. But there is another way that has been followed with encouraging results by energetic country gas managers. Taking one or two of the men of best repute as farmers in their districts, they have arranged for the experimental application, according to rule, upon fields as conspicuously situated as possible, of gratuitous samples of sulphate. The conditions of such a present would naturally be that the farmer should take the trouble to make comparative measurements, as far as possible, of the crops raised with and without the experimental dressing, &c. . . . It is to be hoped that during the current year the Sulphate Manufacturers' Association will be able to collect some information of a trustworthy sort as to the progress that has been made in the popularization of sulphate among British agriculturalists. Where any members of the Association have undertaken this task in their own districts with any prospect of success, they should report their proceedings for the encouragement of others. . . . If anybody has, during the past two years, succeeded in creating a flourishing local trade in sulphate, such as we have had in contemplation and believe to be the best support for small sulphate producers now and in the future, it is to be hoped he will take a fitting opportunity for telling his colleagues all about it.

These suggestions then are my apology for introducing this subject to your notice on the present occasion; for we have, in Jersey, succeeded, within the past six or eight years, in disposing of the whole of our make of sulphate of ammonia to the local farmers for agricultural purposes.

As doubtless many of those present may be aware, the principal industry of Jersey is the cultivation of the "early potato." This produce is exported in large quantities to the English markets, and is a considerable source of revenue to the farmers. The total area of Jersey is 28,717 acres. The acreage under all kinds of crops, bare, fallow, and grass, is about 20,000 acres, of which 6000 to 7000 acres are laid out annually for the cultivation of the potato; being equal to 34 to 35 per cent. of the total acreage under cultivation.

Nature has endowed the island with exceptional advantages as regards weather, climate, soil, &c., which form the key-note of its prosperity; while the system of agriculture is, in a manner, unique. The precocious activity given by the climate to vegetable growth, renders it especially profitable that manures should be liberally applied. In Jersey, potatoes are frequently grown on the land for several years in succession. There are numerous instances of land advantageously situated on which this produce is grown continuously year after year.

A potato crop is very exhausting to the soil, especially as regards potash and nitrogen. It has been calculated that a crop of potatoes, of 8 tons to the acre, removed from that acre from 160 to 180 lbs. of mineral matter, including from 33 to 36 lbs. of phosphoric acid, 80 to 89 lbs. of potash, from a trace to 3 lbs. of soda, from 4 to 6 lbs. of lime, from 7 to 9 lbs. of magnesia, from 10 to 13 lbs. of sulphuric acid, and about 45 lbs. of nitrogen. Now, there is not enough farm manure produced in the island to supply all the land under cultivation; and even if there were, it would not supply the necessary amount of fertilizing ingredients which this crop needs in order to prove remunerative. Again, earliness of crop is of the utmost importance to Jersey farmers, for therein lies their main source of profit; and as potatoes are only to be got early, in good quantities and of good quality, by liberal manuring, it is necessary to apply artificial manures.

When early potato growing was first introduced on a large scale, it was found profitable to manure heavily, not only with farm manure and seaweed, but with Peruvian guano also. As this guano became scarce, mixed chemical manures were introduced to take its place; but they still went under the name of "guano." By-and-bye the farmers began to understand this fact; and it occurred to some of the more astute among them to mix the manures for themselves. The subject was taken up by one or two farmers, and put to practical tests, with encouraging results.

A friend of the writer's, who had applied himself to a careful study of this question, began making experimental plot trials on his own farm. He purchased a few parcels of sulphate from the gas-works, and made up several mixtures with sulphate of ammonia, superphosphates, and potash salts; using them on plots adjacent to those manured with the artificial manures or "guano" of various makers. The results obtained were both interesting and instructive, as they revealed to him what suited and what did not suit the soil and crop dealt with. These experiments were carried on for some time; and, by carefully noting the action of the various ingredients on the soil and crop, and the results obtained, my friend has now hit upon a formula for compounding an "artificial" manure, which he not only uses successfully and profitably on his own farm, but also finds a brisk inquiry for among the local farmers. This season the demand has been unprecedented. During the past twelve months he has had upwards of 70 tons of sulphate of ammonia from the gas-works; the other ingredients—sulphate of potash and sulphate of magnesia (kainit), phosphates in various forms, rape dust, &c.—being obtained direct from the chemical or manure works.

This is only one instance of the development of the home "manure-mixing" industry in Jersey. We have several clients, taking from 1 up to 30 tons of sulphate annually, some of whom mix for their own use only, while others have made manure-mixing an adjunct to the farm work, selling the manufactured article to the local farmers. This industry has now grown to be one of great importance; so much so, indeed, that we have been obliged to import some 40 tons of sulphate this season to meet the requirements of our customers.

The following table, which gives the local and export sales of sulphate of ammonia since 1883, the average price realized per ton, and the percentage sold locally, will convey some idea of the manner in which the local demand has developed during the past eight years:—

Table I.

Year.	Local Sales.			Export Sales.			Percentage Sold locally.
	Quantity.		Average Price realized per Ton.	Quantity.		Average Price realized per Ton.	
	Tons.	Cwt.	£ s. d.	Tons.	Cwt.	£ s. d.	
1883	1	2	20 3 5	64	0	18 7 2	1·69
1884	3	0	17 0 2	108	17	14 0 7	2·68
1885	8	19	16 17 6	60	0	11 15 0	12.98
1886	22	0	13 2 5	91	16	10 8 6	19.33
1887	67	1	11 18 8	29	16	11 1 9	69·23
1888	76	15	11 17 0	34	15	11 11 10	68·83
1889	96	3	11 19 1	*14	8	10 17 10	86·98
1890	All sold locally, and 13 tons imported in addition; average price realized, £11 13s. 4d. per ton.						

* Exported to make room for extensions of plant.

A glance at this table will indicate that, while farmers effect considerable saving by buying their sulphate first hand, the receipts of gas companies may at the same time be considerably augmented. With sulphate at present prices, and taking into account brokerage, commission, freight, cartage, and other expenses, the writer estimates that the Jersey Gas Company effects a saving of at least £200 a year by being able to dispose locally of all this product—a saving equal to 4·1d. per ton of coal carbonized, or 0·42d. per 1000 cubic feet of gas sold.

In order to increase the local demand for sulphate, the great aim should be to induce farmers, by direct experiment, to mix their own "artificial manures." The question then presents itself: "Can this admixing of chemical manures be done advantageously and readily by the farmers themselves?" As has been already said, it is done in Jersey, although the heavy cost of freights and transit of the various chemical ingredients—sulphate excepted—places the farmers at a disadvantage, as compared with those agriculturalists who are within easy range of chemical and manure works in England. Mr. Arnold, Chairman of the Tamworth Gas Company, in an article which appeared in the Journal of Gas Lighting for July 4, 1885, said:

> For many years I have bought sulphate of ammonia and other chemical manures from the manufacturers, and have mixed them carefully myself at home, with the result that I have saved about 33 per cent. in cost, and probably in many cases 10 to 25 per cent. in freedom from adulteration; and, in addition, the heavy commissions paid by manure manufacturers to agents. Even with the best of manure manufacturers, the scale of profit is so heavy that, for a manure costing the farmer (say) from £7 to £8 per ton, I do not think

he obtains more than from £3 to £4 manurial value. There is evidently a wide field here for the farmer to buy at first hand, and mix himself; or of co-operative farmers' associations to do so, and supply on much better terms, and to far greater advantage than now generally obtains.

The advantages, then, may be summed up as follows:—

1. Freedom from adulteration; for by dealing only with firms of established repute, who offer all their chemicals with a written guarantee of purity, the farmer knows he is getting full value for his money. In addition, he sees each article, and can judge of its soundness, that it is dry and well ground; and if needs be, he can have the ingredients analyzed separately.

2. Considerable saving may be effected by purchasing only such material as may be required for the particular land and crops to be treated. In purchasing what are known as "complete manures," prepared to suit all (or most) soils and crops, the farmer has often to pay for material which is not absolutely needed for his particular land; therefore everything superfluous is money practically thrown away.

3. The ordinary labour of the farm can be employed in mixing during the slack season.

The method of preparing an artificial manure is very simple; and, with ordinary care and intelligence on the part of the workmen, and under careful supervision, excellent results would be obtained. The method adopted by a friend of mine in Jersey, in the preparation of his "potato manure," is as follows: The various chemical ingredients, on arrival, are stored away in a dry shed; each parcel being examined to see that it is in a fine, dry, and friable condition—features of vast importance for ensuring a thoroughly efficient "artificial." Immediately adjoining the store is the mixing-shed, provided with a suitable floor of wood or concrete. The only other requisites are a weighing-machine, screening-machine, shovels, beaters, and brushes.

Chemical Ingredients Required—Alkaline Salts and Potash.—Potash constitutes one-half of the ash of the potato, and is, as Ville terms it, "its dominant constituent." This ingredient, together with magnesia, can be supplied through the medium of what is known to the trade as "concentrated kainit," which is composed of sulphate of potash and sulphate of magnesia. A good sample should contain 25 to 28 per cent. of sulphate of potash, and 10 to 15 per cent. of sulphate of magnesia. Sulphate of potash containing about 50 per cent. of potash, or muriate of potash, may be used. Phosphoric acid, a plant-constituent deficient in most soils, is especially useful to the potato. This ingredient is supplied by superphosphates, which contain phosphates—monobasic phosphates—soluble in water, free phosphoric acid, and gypsum (sulphate of lime). The best superphosphates contain 38 to 40 per cent. of "solubles;" and the next quality, about 27 per cent. Those from bones have a fancy price; those containing iron and alumina are less esteemed, as the soluble phosphates are likely to become converted into the insoluble forms by keeping, or, to use the technical term, to "retrograde." When the soil is poor in lime, it may be found advisable to use the lower grade of superphosphates, as they contain more sulphate of lime. The phosphate known as "basic slag" should never be mixed with sulphate of ammonia, as the alkaline lime present will set free the ammonia. Nitrogen is supplied by sulphate of ammonia.

Method of Mixing.—First weigh out the required quantities of the superphosphate and kainit, and mix them thoroughly together into a heap, and allow them to stand for about an hour. Next weigh out the requisite amount of sulphate of ammonia; being careful to break up all the lumps. Throw it on to the screening-machine, and screen into a heap by itself. This process must be repeated until the whole of the sulphate is reduced to a fine state of division; and on no account must any lumps be allowed to mix with the other ingredients. The addition of a little rape dust will tend to make the mixture work better. When this is done, the screen is removed, and the two heaps are thoroughly mingled together. The mixed mass can now be thrown on to the screen, which may be one of the revolving kind, similar to those used for screening coke, ashes, &c., but with the bars closer together, so as to provide a smaller mesh. The fine particles will pass through the meshes of the screen into a heap below, and the larger ones may be collected in a basket at the outlet end of the machine. These are to be broken up and again transferred to the screen to mix with the fine heap. The mass is again passed through the screen—three or four times, if necessary, so as to ensure a perfect mixture; after which it may be stacked away, and allowed to stand for about a fortnight. At the expiration of this time, it may be broken up and passed through the screen, when it is ready for bagging. This last screening is important, as it prevents the manure clogging. If this process is carefully carried out, the manure will be as thoroughly mixed, and as fine as any prepared on a more elaborate scale.

A sample should be taken from the mass and sent off to a reliable analytical chemist for analysis and report. The small cost of such an analysis will be found to be money well spent. Failures may be met with at first; but they should be an encouragement rather than a disappointment—remembering always that often more information is to be gained from failure than if everything went smoothly.

The following are the analyses of two home-made artificial potato manures, made by different farmers, for Jersey soil:—

No. 1.—*By Mr. Alfred Sibson, F.C.S.*

	Per Cent.
Moisture	7·13
Organic matter *:—	
Salts of ammonia	42·26
Monosulphate of lime equal to bone phosphate made soluble (21·80 per cent.)	13·97
Insoluble phosphates	2·49
Alkaline salts and potash	0·20
Sulphate of lime	21·03
Insoluble matter	3·92
	100·00

* Containing nitrogen = 6·50; equal to ammonia, 7·79.

No. 2.—*By Mr. J. Hughes, F.I.C.*

	Per Cent.
Moisture (dried at 212° Fahr.)	6·34
Organic matter *:—	
Ammonia salts, and water of combination	34·41
Monobasic phosphate of lime equal to tribasic phosphate of lime rendered soluble by acid (22·60 per cent.)	14·43
Insoluble phosphates	2·53
Sulphate of lime	33·91
Alkaline salts and magnesia †	7·75
Silica	0·63
	100·00

"Sample in excellent dry condition—in fact, quite a fine soft powder, very suitable for perfect distribution."

* Containing nitrogen = 6·70; equal to ammonia, 8·13.
† Containing potash = 3·92; equal to sulphate of potash, 7·25.

Any comment on the quality of these manures would be superfluous. Suffice it to say the analyst's report appended to No. 2 stamps it as one of exceptional merit.

Manures prepared to give these analyses cost the Jersey farmers from £8 to £8 10s. per ton to prepare. Similar "imported manures" are being sold in the island at £10 to £12 per ton; while in 1886 they were being sold at £13 to £14 per ton.

I may here give the results of some experiments on potato culture, made by Mr. F. W. Toms, F.I.C., F.C.S., Official Analyst of Jersey, for the purpose of testing the requirements of the soil. They have been presented to the Royal Jersey Agricultural and Horticultural Society. Six plots of ground, each one Jersey perch, 22 feet square (90 Jersey perches = 1 English acre) in area, were carefully staked out, and the crops manured after the following manner:—

No. 1.—Blank (no artificials). This plot formed the standard of comparison.

No. 2.—Ammonia salts only. Sulphate of ammonia, 5 lbs. (or at the rate of 450 lbs. per acre).

No. 3.—Phosphates only; 10 lbs. of superphosphate—26 per cent. soluble (or at the rate of 900 lbs. per acre).

No. 4.—Potash only; 5 lbs. of kainit, 2½ lbs. of muriate of potash (or at the rate of 450 lbs. of kainit, and 225 lbs. of muriate per acre).

No. 5.—Ammonia and phosphates; 5 lbs. of sulphate of ammonia, and 10 lbs. of superphosphates (or at the rate of 1350 lbs. per acre of a mixture containing 8 per cent. of ammonia, 17 per cent. of soluble phosphates).

No. 6.—"Complete manure," or ammonia, phosphates, and potash 5 lbs. of sulphate of ammonia, 10 lbs. of superphosphates, and 2½ lbs. of muriate of potash (or at the rate of 450 lbs. of sulphate of ammonia, 900 lbs. of superphosphates, and 225 lbs. of muriate of potash per acre).

Though the quantities of the chemical ingredients used may appear heavy, they are not much in excess of those commonly employed in Jersey.

TABLE II.—*Soil-Testing Experiments, Jersey.*

Results of "Plot Trials" Calculated in Tons and Hundredweights per Acre.

Manures used.	Experimenter A. Tons.	Cwt.	Experimenter B. Tons.	Cwt.	Experimenter C. Tons.	Cwt.
No. 1.—Blank plot—standard of comparison .	6	12	10	9	9	18
„ 2.—Ammonia only . .	10	6	14	10	13	17
„ 3.—Phosphates only .	7	8	10	10	12	7
„ 4.—Potash only . . .	7	7	13	1	11	17
„ 5.—Ammonia and phosphates	10	8	17	1	15	19
„ 6.—Ammmnia, phosphates, and potash . .	10	13	17	11	14	9

Special Details.

A.—In these results, 5·3 per cent. of small potatoes were not included. Royal Jersey Flukes—planted March 2; lifted July 3. All the plots had been dressed with seaweed and farm manure. Previously old pasture land.

B.—In these results, 3·7 per cent. of small potatoes were not included. Royal Jersey Flukes—planted, March 3; lifted, July 13. All the plots had farm manure. Potatoes grown last year.

C.—In these results, 8·1 per cent. of small and diseased potatoes were not included. Kingsbridge Flukes—planted, March 7; lifted, July 19. No other manure used this year. Last year land in potatoes and swedes, previously in grass.

Remarks.—Season abnormal and late; cold at beginning, very wet at end. Four inches of rain fell in March, only 3½ inches in April and May, but 8½ inches in June and July.

TABLE III.—*Amount of Increase produced by Certain Chemicals.*

Estimated by subtracting the Saleable Potatoes in "Blank Plot" (No. 1), from Saleable Potatoes in those Artificially Manured.

Increase over Blank Plot due to—	Land Experimented upon. A. Tons.	Cwt.	B. Tons.	Cwt.	C. Tons.	Cwt.
Plot 2.—Ammonia salts, at the rate of 450 lbs. per acre . . .	3	14	4	1	3	19
„ 3.—Phosphates, 900 lbs. per acre . . .	0	16	0	1	2	9
„ 4.—Potash salts mixed, 675 lbs. per acre .	0	15	2	12	1	19
„ 5.—Ammonia and phosphates 1350 lbs. per acre	3	16	6	12	6	1
„ 6.—"Complete," or ammonia phosphates, and potash, 1575 lbs. per acre . .	4	1	7	2	5	1

Cost of Chemicals.

Plot 2, £2 16s. 3d. per acre, or £12 10s. per ton; plot 3, £1 4s. 9d. per acre, or £2 15s. per ton; plot 4, £1 7s. per acre; plot 5, £4 1s. per acre, or £6 per ton; plot 6, £5 1s. 3d. per acre, or £6 10s. per ton.

Inference (*see* TABLE II.).

A.—Land deficient in nitrogen (ammonia, &c.); fairly supplied with potash and phosphates.

B.—Land deficient in nitrogen; well supplied with phosphates; deficient in potash.

C.—Land deficient in nitrogen and phosphates; potash doubtful.

TABLE IV.—*Soil-Testing Experiments*, 1889.

Results of "Plot Trials," calculated in Tons and Hundredweights per Acre.

Manures used.	Experimenter D. Tons.	Cwts.
No. 1.—Nothing—standard of comparison	9	0
„ 2.—Sulphate of ammonia, at the rate of 450 lbs. per acre	11	4
„ 3.—Phosphates, 26 per cent. soluble, at the rate of 900 lbs. per acre	10	15
„ 4.—Sulphate of ammonia, 450 lbs. per acre; phosphates, 900 lbs. per acre	16	14
„ 5.—Sulphate, 270 lbs. per acre; phosphates, 1080 lbs. per acre	12	18
„ 6.—Sulphate, 450 lbs. per acre; phosphates, 900 lbs. per acre; sulphate of potash, 225 lbs. per acre	14	19
„ 7.—Blood manure, 315 lbs. per acre; nitrate of soda, 180 lbs. per acre; phosphates, 1080 lbs. per acre	14	10
„ 8.—Blood manure, 315 lbs. per acre; nitrate of soda, 180 lbs. per acre; phosphates, 1080 lbs. per acre; sulphate of iron, 80 lbs. per acre	16	16
„ 9.—Dissolved bones, 900 lbs. per acre	13	13

Remarks.—The potatoes grown were Royal Jersey Flukes. Vetches were grown during the previous autumn; and the land was then manured with town dust. Potatoes planted, March 7; dug, June 19.

From these facts (see Tables II. and III.), it will be seen that in each case nitrogen was deficient in the soil, since 450 lbs. of sulphate of ammonia per acre gave an increase of close upon 4 tons of potatoes. It will also be noticed that No. 5 plot (Table II.) treated with one part of sulphate of ammonia and two parts of superphosphate, costing about £6 per ton, gave results difficult to excel. Plot A, having been old grass land, and freely manured with seaweed and farm manure, did not require much phosphates or potash, except to compensate for the exhaustion of the potato crop and second crop. Although the crop is smaller than the others, this may be due to the fact that it was lifted ten days earlier. Plot B had been under potatoes and roots during the previous year, and, as it received no farm manure nor seaweed, it naturally required everything. Plot C, having been liberally supplied with farmyard manure, had little need of phosphates. It required potash, as the land showed it to be poor in this ingredient. These results are very interesting, as they indicate what ingredients were required to be given artificially to the soil, in order to furnish it with the plant-food necessary for the proper growth of the crop, so as to give the utmost clear profit on the outlay.

The value of plot trials is unquestionable. They can be carried out without interfering much with the other work of the farm; and by their means any farmer can get to know the composition of the soil, and so ascertain what stimulants are required to suit the land and crops with which he has to deal. "These small trial plots," says Mr. George Ville,* "are like sentries placed in observation; and every intelligent grower, farmer, steward, or proprietor ought constantly to consult them, as a captain at sea consults his barometer and the direction of the wind. In order that these trials on a small scale may be of great utility, they must be begun a year before the systematic use of chemical manures on the whole farm. In this way their evidence is always a year in advance of the application on a large scale." Each individual farmer ought to experiment for himself; for results obtained on one farm cannot apply to all; as the conditions of the soil on different farms may be very diverse.

[The author next gave some statistics as to the average number of acres of land under cultivation for potatoes in Jersey, the average yield per acre, and the export trade, for the past seven years; also as to the production of potatoes in the various divisions of the United Kingdom last year. He then passed on to consider the importance of nitrogen in agriculture.]

The element nitrogen is of the greatest interest to the practical farmer, from the fact that plants cannot thrive without it, that the resources of the natural soil with respect to this ingredient are readily exhausted, and that a renewal with artificial supplies of nitrogen is an exceedingly costly one. The principal sources of nitrogen are the atmosphere and nitrogenous organic compounds—such as farm manure, rape cake, blood, fish manure, shoddy, &c. These are, however, relatively slow-acting and wasteful, as compared with the more concentrated forms of nitrogen—sulphate of ammonia and nitrate of soda.

A glance at the following table by Mr. C. M. Aikman † which gives approximately the amount of nitrogen removed from the soil by the total produce of wheat, barley, and oats in Great Britain, according to the agricultural returns for 1887, will show what an important part nitrogen plays in plant economy:—

—	Production.	Containing Nitrogen.	Equal to Sulphate of Ammonia.	Equal to Nitrate of Soda.
	Bushels.	Tons.	Tons.	Tons.
Wheat	76,224,940	37,432	176,465	227,266
Barley	69,948,266	27,324	128,813	165,896
Oats.	150,789,416	56,835	267,936	341,010
Totals . . .	296,962,622	121,591	573,214	734,172

In face of these facts, what do we find? That more than one-half of the sulphate of ammonia produced in the United Kingdom is exported to the Continent of Europe for agricultural purposes; while the three crops alone which are enumerated in the foregoing table could well do with all the sulphate of ammonia actually produced in the whole of the kingdom, and even more.

[The author then quoted the statistics given by Messrs. Bradbury and Hirsch in their last "Annual Review," as to the sources and respective quantities of sulphate of ammonia produced in the United Kingdom from 1886 to 1890, and the delivery and exports for 1888, 1889, and

* "On Artificial Manures," by G. Ville. (London: Longmans.)

† "Nitrogen: Its Uses and Sources in Agriculture," by C. M Aikman. (Glasgow: C. L. Wright.)

1890. (These figures will be found *ante*, p. 27.) He also gave a diagram compiled from the same source, showing the comparative average monthly prices of sulphate of ammonia and nitrate of soda in the three last-named years.]

Although much has been done of late years in order to popularize the use of sulphate of ammonia as a manure, and to draw the attention of agriculturalists to its advantages, there is still a wide field for combined action on the part of sulphate producers to create increased local demand. Those interested in nitrate of soda are evidently alive to the situation, for the amount of literature which is being disseminated throughout the country, in the shape of prize essays, practical hints as to the uses of this fertilizer in agriculture, lectures, &c., cannot fail to have an effect.

Mr. Ludwig Mond, in his presidential address to the Society of Chemical Industry in 1889, said:

> For many years Europe has paid to South America millions upon millions of pounds solely for ammonia in the shape of guano; and more recently, since the supply of guano practically ceased, for nitrate of soda, which effectually serves the same purpose as ammonia. During the past year, South America exported 750,000 tons of nitrate, of which 650,000 went to Europe, representing a value not less than £6,500,000. The problem of saving this immense expenditure to Europe, of making ourselves independent of a country so far away for the supply of a material upon which the prosperity of our agriculture—our most important industry—depends, by supplying this ammonia from sources at our own command, is certainly one of the most important which our science has to solve.

Commercial sulphate of ammonia usually contains about 24½ per cent. of ammonia, equal to 20 per cent. of nitrogen; and, when obtained from the gas-works, it is generally free from adulteration. This product is one of the most concentrated forms in which ammonia can be supplied to the land; and whether used alone or in conjunction with farm manure, the effects produced upon vegetable growth are such that, in many instances, crops have been increased very considerably both in quantity and in quality. M. Ville says:

> Sulphate of ammonia is a product whose action is immediate if the soil be at all moist; but it must be used with great prudence. The most suitable quantity to use is from 260 to 354 lbs. per acre when only chemical manures are employed. But this product is of the greatest use when it is a question of saving a crop endangered by a too severe winter. About 176 lbs. of ammonic sulphate applied in the month of March will cause the crop to spring up as if by magic. . . . It is again of the greatest help in increasing the crop of grain without detriment to the straw. To obtain this result . . . give to cereals about ½ cwt. of sulphate per acre at the end of the month of March; provided always that the soil has been properly prepared and manured in the autumn. For meadow land, small quantities applied four or five times a year tend to promote the formation of grass, and also to render it more nutritious. From 175 to 220 lbs. about four times a year is a suitable quantity.

From experiments recently carried out at Rothamsted, it has been found that a mixture of 1 cwt. of sulphate of ammonia to 3 cwt. of sulphate of potash, applied per acre early in April, has proved effectual in stopping "clover sickness."* Professor Jamieson has shown that sulphate is a more suitable manure than nitrate of soda for application with insoluble phosphates on clayey and strong lands. Professor Tanner has found that sulphate of ammonia greatly improves, and nitrate of soda invariably injures, the malting character of barley.† Some experiments on potatoes show that sulphate of ammonia favours the formation of starch (giving mealiness to this product) more than nitrate of soda. Dr. Voelcker's report for 1888,‡ on the continuous growth of wheat at Woburn, shows that sulphate of ammonia has a more lasting effect on the soil than nitrate of soda. When each salt was omitted from a certain plot, the produce from the nitrate plot had grown down to the level of the unmanured plot; while that manured with sulphate the previous year produced an increase of 6 bushels of corn and 6 cwt. of straw. Similar results are shown with barley. Continental experiments with beetroot show that dressings of sulphate produce a larger percentage of sugar in certain kinds of roots than when nitrate is used as a manure. Professor Church says: "Nitrate of soda tends to sodden heavy soil, and thus seriously injures its physical condition; from this drawback sulphate of ammonia is free."

Although sulphate of ammonia is not so quick in its action as nitrate of soda, it has been found that the ammonia in sulphate is held with greater tenacity by the soil than nitrate, thus providing a more regular and even supply of food to the plant. Again, sulphate is not so liable to be washed out of the soil as nitrate; and on this account it is considered less wasteful. In fertilizing power, 4 cwt. of sulphate is equal to 5 cwt. of nitrate.

1 cwt.	sulphate supplies as much	nitrogen	as	2	tons	well rotted dung.
1 „	kainit	„	„	potash	as	1½	„	„	„
1 „	steamed bone flour	„	phosphate of lime as	4	„	„	„

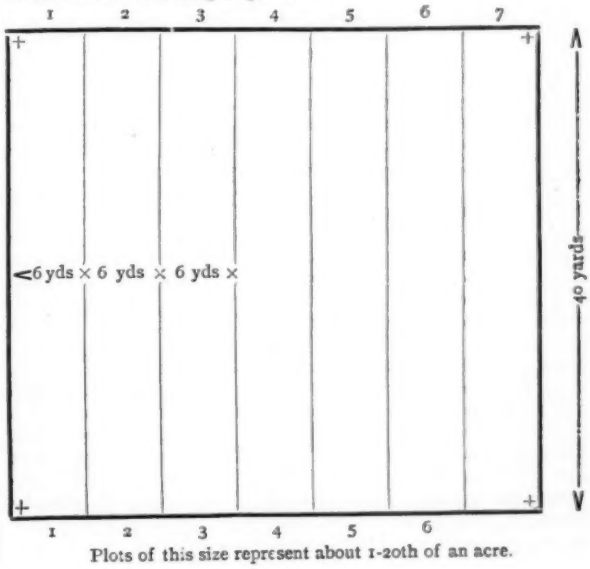
The old prejudice that sulphate of ammonia exhausts the soil is—thanks to the light which scientific knowledge has thrown upon the subject—fast dying out. It has been shown that if this product is properly applied along with the other ash constituents, superphosphates, potash, &c., not only is the land much improved, but the crops also. The manner in which sulphate has maintained its price, and also the steady increase in the home consumption during the past few years, notwithstanding the low price of its competitor—nitrate of soda—seems to be a clear indication of the high esteem in which it is held by those who use it.

The question of increased local demand for sulphate of ammonia is of paramount importance to gas manufacturers, and one which is worthy of the consideration of The Incorporated Gas Institute (with the co-operation of the kindred Associations), with a view to the arranging throughout the country of a series of "experimental plot trials." Such tests would be of considerable utility to agriculturists generally, and would probably do more in the way of popularizing sulphate of ammonia than all the literature which could be brought to bear upon the subject. The methods of making such tests are very simple, and the cost is trifling. The scheme might be set about somewhat on the following lines: First, secure the services of a thoroughly practical agricultural chemist. Have schedules and instructions drawn up and printed, describing the plans and methods to be adopted in carrying out the tests, and how to deal with the results obtained. These schedules and instructions to be distributed to all the gas managers in the kingdom, requesting them to interview some of the farmers of the best standing in their respective districts, with the object of carrying out the tests according to rule. The results thus obtained and collected together would not only form a most interesting appendix to the Transactions of the Institute, but the farmers would find the experiments an easy and ready method of testing the manurial value of their land.

With a view to aid such a movement, the writer has compiled the following schedules, A and B, which are in harmony with similar ones suggested by Dr. A. P. Aitken for the Highland and Agricultural Society, Professor W. O. Atwater, Ph.D., and others, for the purpose of testing the manurial value of soils, and conducting field experiments with various fertilizers.

SCHEDULE A.—*Directions for Making the Plots, &c.*

Select a field representing fairly the average quality of the land to be under cultivation the year following. Divide it into (say) seven plots, each 40 yards long by 6 yards wide, and number them 1, 2, 3, 4, 5, 6, 7. At each plot drive in a good stake, and draw a line between, as shown in the following diagram:—



Plots of this size represent about 1-20th of an acre.

* *Journal of the Society of Chemical Industry*, Vol. IX., p. 307; also JOURNAL, Vol. LV., p. 737.

† *Journal of the Bath and West of England Society.*

‡ *Journal of the Royal Agricultural Society of England*, for April, 1889, pp. 297-302.

No. 1 plot, to receive no manure, would be the "standard of comparison."
No. 2 plot, to receive a dressing of sulphate of ammonia only.
No. 3 ,, ,, ,, potash only.
No. 4 ,, ,, ,, phosphates only.
No. 5 ,, ,, ,, sulphate of ammonia and phosphates.
No. 6 ,, ,, ,, sulphate of ammonia and potash.
No. 7 ,, ,, ,, sulphate of ammonia, phosphates, and potash.

The quantities of the various chemicals to be used are to be determined upon by the chemist, so as to suit the requirements of the crop and district.

Each parcel of manure should be well mixed and screened, put into small bags, and carefully labelled. When only one ingredient is to be used, it might be advisable to mix it with some dry sand or earth, so as to ensure even distribution.

At the harvest, the resultant crops should be carefully weighed, and a record kept of the amount realized by the sale of produce, cost of manures, character of the weather during each month, together with any notes of interest bearing upon the experiments, and all recorded in Schedule B.

SCHEDULE B.—*Plot Experiments.*

Name and address of experimenter.....
Character of soil .....
Details of previous manuring and cropping .....
Crop under experiment .....
Date of sowing or planting.....
Date of harvesting .....
Weather during the experiments .....
General observations during the experiments .....
.....
.....

Results of the Crops.

No. of Plot.	Weight of Crop.		Value of Crop.		Cost of Manure per Acre.	Remarks.
	Per Plot.	Per Acre.	Per Plot.	Per Acre.		
			£ s. d.	£ s. d.	£ s. d.	
1						
2						
3						
4						
5						
6						
7						

In conclusion, I have to express my best thanks for the valuable assistance I have received in compiling this paper, and for the "soil-testing experiments," &c., to Mr. F. Woodland Toms, F.I.C., F.C.S., Official Analyst of Jersey; and to Mr. C. C. Picot and other friends, for many practical hints and suggestions.

Although I have confined my remarks principally to the employment of sulphate of ammonia in potato culture—for on this subject I have had the most experience—yet it must be understood that sulphate admits of almost unlimited application in agriculture, and ought to be more generally made use of by those engaged in this great national industry. What I have herein endeavoured to elucidate will, I trust, be the means of encouraging other gas managers to induce farmers to experiment with this fertilizer, and then come forward and relate their experience for the benefit of their fellow-members.

Discussion.

The PRESIDENT said the paper just read was one of the most interesting submitted during the session; and he felt especial pleasure in listening to it, because Mr. Ritson had graduated in Carlisle. He could only hope the discussion would be as good as the paper.

Mr. C. A. CRAVEN (Dewsbury) congratulated the author on having given one of the most interesting papers he had ever heard. Mr. Ritson was evidently in a very favourable position for disposing of sulphate of ammonia. He should like to know what was the average rent per acre of land in Jersey. He knew that the crops they sent to market arrived so early that the landlords were able to get three or four times the rent they did in the neighbourhood of Carlisle. He was interested to a small extent in land in the adjoining county; and therefore looked at the subject from two points of view—as a landowner, and as a provider of sulphate of ammonia. He had tried to induce the neighbouring farmers to use this kind of manure; but the farmer's mind was peculiarly constituted, and possessed an amount of inertia which it was very difficult to remove. He would suggest the publication of the paper in pamphlet form. He did not see why they should not deal with the farmers direct, instead of leaving the matter to the "bulls" and "bears" of the market. The author seemed to think it was very strange that people were so loth to sell, and yet the price was kept down so low; but in most cases, where stocks were controlled by speculators, it sometimes happened that the price was above, and at other times much lower than, the intrinsic value. One of the factors influencing the sulphate market was the large importation of nitrate of soda; but the stocks of nitrate had lately been much reduced. He should recommend those having stocks of sulphate not to give it away, because the market must improve when it was better known; and if they did not play into the hands of those who were interested in bringing down prices for their own benefit, they would eventually see better prices ruling. He was not in a hurry to sell; and he generally managed to get a few shillings a ton more than the quoted price. He also believed in endeavouring to create a local market; and his local sales averaged 10s. to 12s. per ton more than if he sold for shipment at Goole or Liverpool. They might do something in bringing down the rates of carriage; but that would not amount to very much. Many of the fabricated manures were worth very little. One of his men once went to a manufacturer of patent manure, and was inquisitive enough to want to know what was in it; but the maker would not tell him. However, he took up a portion, and managed to find out for himself. He (Mr. Craven) need only say that the principal ingredient was something commonly carted away from all large towns. This was sold along with a few other things, and a large price obtained for it. If they could get sulphate of ammonia, and mix it as described by Mr. Ritson, farmers would obtain better results than they were now getting. They would have a genuine article; and they might rely upon it that good crops would follow good farming.

Mr. W. R. CHESTER (Nottingham) also expressed his gratification at the paper, which, he said, overflowed with information that all needed. It would be useful to every gas manager who made sulphate of ammonia, and would probably aid him in finding a local market for it. He (Mr. Chester) could not help being surprised at the somewhat curious manner in which the last speaker endeavoured to create a local market—by endeavouring to get 10s. or 12s. a ton more than he would charge if he sent it out of the country. This was not a very patriotic course, or one which was very likely to develop local consumption. He always endeavoured to put the local users on the best terms at which he could offer the material to be shipped; and in this way he gave them the best inducement to take advantage of their geographical position. The result was that they had a growing business. The annual make was about 1500 tons; and they sold a little more than 100 tons for use in the neighbourhood of Nottingham. The purchasers of lots even as small as 2 or 3 tons were placed on the best terms of the day. He thought it would be well if the paper were published in a separate form, and distributed in country districts. The tabulated figures were most interesting; and he hoped the suggestion that others would undertake experiments of a similar kind would be followed. He had tried in every possible way to push local sales, and had allowed discounts to the dealers and manufacturers of artificial manure sufficient to induce them to stimulate trade with their own clients; and they had taken it up in a very satisfactory manner. He hoped the time was not far distant when all the sulphate of ammonia made in England might be utilized in the country itself, and when the English agriculturist would see that it was to his advantage to employ this material, instead of sending it to the Continent, where it must bear a carriage rate of £2 a ton more.

Alderman MILES (Bolton) remarked that it must be borne in mind that Mr. Ritson was dealing with a very fruitful island, which was also celebrated for the production of potatoes; and he (Alderman Miles) could quite see the great advantage to be gained by the farmers there, who desired to get their crops to the market early in the season. Most of those present, however, were located in a part of the country which was not so fertile as Jersey, and possibly lived among farmers who were not so intelligent as those in the island. The farmers in his neighbourhood were very difficult to persuade. One might spread amongst them what literature one pleased, but it would have very little effect. They seemed better acquainted with the ordinary classes of manure than with

the patent ones. At the present moment they had to cart away from their Bolton Gas-Works to a considerable distance all the spent lime, which many of the farmers would not have at a gift. But they were trying to obviate this by distributing literature of a simple character; and if Mr. Ritson could tell them how to get at the intellect of the farmers, he would do a great deal. He was much struck with the observation of Mr. Chester, who did not seem to see eye to eye with Mr. Craven with regard to getting the best price for the sulphate sold locally. But he (Alderman Miles) fancied Mr. Chester hardly comprehended Mr. Craven's idea. He probably meant that, rather than the farmer should purchase his sulphate from the middleman, he sold it direct to him, and so saved the profit, and let the farmer have it as cheap as before.

Mr. CRAVEN said that was his meaning.

Alderman MILES said this was a businesslike view of the question. The plan of experimental plots was a very good one; and, if carried out, it would no doubt do a great deal to make sulphate of ammonia more popular.

Mr. D. VASS (Portobello) said in his neighbourhood farmers sometimes made complaints about the use of sulphate of ammonia. One was that stock reared on sulphate were subject to diabetes. It might be useful that this question should be considered.

Mr. T. TREWETT (West Hartlepool) said he could confirm some of the experiments quoted by Mr. Ritson by those he had himself made. He thought the paper ought to be reprinted and distributed amongst farmers. The Institute ought not, however, to bear the cost, but the sulphate makers.

Mr. J. R. SMITH (Padiham) said that when reference was made to the obtuseness of Lancashire farmers, it ought to be borne in mind that the Jersey farmer had very great freedom in regard to the way in which he might cultivate his land; and though he agreed that there was almost stupidity on the part of some Lancashire farmers, they were much crippled as to what they might do. He (Mr. Smith) had in his possession the lease of a farm of 60 or 80 acres, in which it was stipulated that only a few poles of that land should be devoted to market-garden purposes; so that whatever desire a farmer might have to develop the cultivation under the lease, he could not do so. Most of them were hampered in a similar way.

Mr. J. CHEW (Blackpool) said that he sold locally about 20 per cent. of the sulphate of ammonia made on their works; and it chiefly went into the hands of one manufacturer. This man was invading the North with large quantities of manure—selling many thousands of tons—containing his sulphate of ammonia in it, though with other ingredients in addition. It was not generally understood, perhaps, that these manure manufacturers gave long credit; and if they sold the sulphate locally, they must be prepared to give the farmers the same advantage, and also endeavour to educate them. Probably the technical schools would do this later on; but in the meantime, the distribution of literature like the paper before them would, no doubt, be very useful. As to the question of who should bear the expense, it occurred to him that as The Gas Institute was supported chiefly by gas managers, it was not for them, but for the proprietors of the gas-works, who would benefit by the sale, to pay the cost of distributing the literature. He did not suppose the Institute or the author would object to give permission to the paper being reprinted; and no doubt the Institute would do a great deal more if they had more funds at their disposal. They ought to be able to advise as to mixtures of these manurial ingredients; but if the information could be distributed free among the people who consumed these things, no doubt it would bear fruit some day.

Professor FOSTER (London) said he was one of the first to write on the subject of the use of ammonia in agriculture. He seemed to oscillate between farming, gas-making, and teaching chemistry generally; and it appeared to him the duties of gas engineers were just now multiplying almost indefinitely. They were going to be not only gas makers, but chemical manufacturers; and there was now a scheme for supplying farmers with information and instruction. He belonged to the yeoman class, and therefore he could say something on this matter from his own experience; and he appreciated the paper most highly. He spent as many weeks of the year as he could with farmers, not in the county of Lancashire, but in the adjoining one; and 25 years ago better farming could not be found anywhere in the United Kingdom, not even excepting the Lothians. He was sorry he could not say so now. The reluctance of the farmer to purchase these manures arose in this way: It was not altogether ignorance; but when he bought manures from manufacturers and salesmen, the gross imposture to which he was often subjected was a matter which made him fight very shy of some of his would-be benefactors. The proper place for making the ammonia was on the farm; and the quantity of the stuff put into the land should bear some ratio to that which came off. Ordinary dung was, far and away, the best all-round fertilizer. If the farmer attempted to dose his land with sulphate of ammonia, nitrate of soda, or any other drug—for it was a drug when used alone, as when mixed in proper proportions it became an article of diet—he did more harm than good. One of the effects of some of the earlier leaflets on this subject was to overdo the case, and to recommend the addition of ammonium sulphate in far too large quantities. It required to be mixed with other constituents, such as he (Professor Foster) had most pertinently put forward; and if they were to do any good at all in this way, they must set up as chemical advisers as well as gas engineers and chemical manufacturers. The farmer was ignorant; he fully confessed it. He knew nothing as to the precise constituents of these manures. Again, he was tied by the circumstances of the case, and also by his leases. There were, unfortunately, few of the old yeoman class remaining; and therefore the farmer now had only a temporary interest in his land. Then the question was asked why such large quantities of this ammonium went to Central Europe, France, and elsewhere. It was simply to help to grow beetroot—a vegetable which required large doses of nitrogen—for making sugar. With reference to mixtures, this was a point of great importance; and any dissemination of information on the question of those which farmers might use would be very useful. He would put it to any member of the Institute, if he were asked to employ a piece of apparatus, would he be prepared to undertake it unless it were in his hands perfectly ready for use? He would say: "If you cannot give me what I want, it is of no use to me." In the same way, if they could not give the farmer what he wanted in manure in the shape of a mixture, he did not care to purchase a thing of this kind; knowing, of course, from agricultural literature, that mixtures were essentially necessary for such purposes.

The PRESIDENT said he agreed with the suggestion made in the course of the discussion, that it would be very important if copies of the paper could be placed at the disposal of the members of the Institute, Gas Companies, and Corporations, who might require it for distribution. The information it contained could not be put in a better way for educating farmers, and there was no doubt they needed education. There was a gentleman in that county who was an enthusiast in this direction; and he gave a lecture a few weeks previously to a body of farmers. He thought he had them all with him. They seemed to be intensely interested; and the use of sulphate of ammonia was one of the things he recommended. At the close of the proceedings, one of the most intelligent-looking farmers rose to propose a vote of thanks to the lecturer. He said he had enjoyed the lecture very much; but, to his mind, the best thing they could have was a reduction in rents—they did not want his "learning." This gross ignorance could only be got rid of little by little; and he knew of no better information that could be placed before the agricultural mind than was embodied in the paper.

Mr. RITSON, in reply, said he was much gratified with the acceptance accorded to the first paper he had read, which was sufficient encouragement to him for the trouble he had taken in preparing it. His answer to the question as to the rent of land in Jersey would, no doubt, be surprising to many English farmers. It was from £8 to £12 an acre. Doubtless an English farmer would look very queer if he had to pay this sum, and make a profit out of it; but the Jersey farmer paid it, and realized a profit. These men were very thrifty; and a great deal of their success was due to themselves. But they and their wives did a great deal of work on the farm themselves. He knew that, in order to push the sale of nitrate of soda, many pamphlets were being distributed and lectures delivered all over the country; and it seemed to him to be only rational to consider whether gas managers as a body should not engage some professional agricultural chemist

to give lectures on sulphate of ammonia. If it paid the nitrate of soda people, it scarcely ought to pay the sulphate of ammonia people. Mr. Chester was perfectly right in saying that the farmer should be encouraged. His object was not so much to make profit, as to sell as nearly as possible at London prices, so that the farmers could really make something out of it themselves. If he were to sell his sulphate at £2 or £3 a ton more, the probability would be that the stuff would be imported into the islands in much greater quantities than at present. They had even now increased the profit at least £200 a year, selling at the London price of £11 15s. per ton; and large consumers were allowed 2½ per cent. discount. Alderman Miles had suggested that he ought to be given some idea as to how the disposal of sulphate of ammonia should be made a general rule; but this was very difficult to do. What suited one locality would not suit another. He had given his experience in Jersey; but that which agreed with the Jersey soil might not be very much in excess of what should be recommended for England. He might say, however, that the amount of the various chemical ingredients for the Jersey perch, if used for the English perch, would be about right for average English land. He understood Mr. Vass to ask if the use of sulphate of ammonia produced such an effect on the stalk of cereals as would give rise to diabetes. He could only say that of this he had had no experience.

Mr. VASS explained that the complaint was that animals fed on grass land which had been treated with sulphate of ammonia had had diabetes. It was, however, only the assertion of a local farmer.

Professor FOSTER said he had never heard this stated. He could understand sulphate of ammonia, as such, doing so if it were put on land in excessive quantities in unduly dry weather; but he had never heard of plant-life absorbing any constituent so as to be productive of this particular disease, and he should not be disposed to accept it at present.

Mr. RITSON, in conclusion, said that Mr. Trewett's suggestion as to the distribution of the paper was one for the Institute to solve. With regard to Mr. Smith's remarks, there were undoubtedly in England a great many stumbling-blocks which did not exist in Germany. There, in the majority of cases, the farmers were their own landlords; and in some instances they paid £200 an acre for the land. As to the imposture that was carried on by many manure makers, he could quote one instance in which a mixer in Jersey wanted to sell some corn manures to a farmer friend of his; and he simply put the stuff he sold for potatoes into bags with a different label. Both nitrate of soda and sulphate of ammonia, if used alone, had a considerable tendency to exhaust the land; but no practical farmer would attempt to use them alone, except in certain cases—as, for instance, on grass land. The proper way was to mix them with other constituents of the plant, especially superphosphates and potash salts.

Books Received.—"Patents for Inventions, and How to Procure them," by G. G. M. Hardingham, Assoc. M. Inst. C.E. London: Crosby Lockwood and Son. "The *Electrician* Primers." Vol. I.—Theory. Vol. II.—Practice. London: The *Electrician* Printing and Publishing Company, Limited.

Society of Arts.—The annual general meeting of this Society was held in the Hall, John Street, Adelphi, last Wednesday afternoon—Sir F. Bramwell, Bart., Deputy-Chairman of the Council, presiding. The Secretary (Sir Henry Trueman Wood, M.A.), read the report, which summarized the papers brought before the several sections of the Society during the past year. Referring to the first of the courses of Cantor Lectures—those given by Professor Vivian B. Lewes, F.I.C., F..CS., on "Gaseous Illuminants," which were fully reported in the JOURNAL in December last—it was pointed out that the subject had been previously dealt with before the Society by Professor Vernon Harcourt, in 1877, as well as in various papers; but that Professor Lewes had taken up the more recent improvements introduced into the manufacture of gas, especially the use of water gas, and had also gone to a considerable extent into the proper conditions under which gas is best used, both as an illuminant and as a fuel. After mentioning the award of the Albert Medal of the Society for the present to Sir F. Abel, F.R.S., as notified in our columns last week, the report gave a list of medals awarded to the readers of papers during last session. Included in these was one to Professor W. Robinson, for his paper on "The Use of Petroleum in Prime Motors." The usual ballot for officers took place; among the new members of Council elected being Sir J. N. Douglass, F.R.S., and Mr. W. C. Roberts-Austen, C.B., F.R.S.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1327.)

THE position of affairs in the Stock Exchange remains practically unchanged from what it was a week ago; and it cannot be said that there is as yet any sign of an approaching improvement. There was indeed, in the course of the week, some little business doing in "gilt-edged" securities, as a certain amount of money had to be invested somehow; but the total would scarcely have been perceptible except in contrast to the absolute blank presented everywhere else. Utter stagnation is the general characteristic all round; and it is not easy to recall a time when the complaint of dearth of business was so universal. As to the Money Market, the market is full of money, and nobody wants it. Even the Gas Market is no exception to the ruling calm; and business has been much below what it normally should be. However, the lack of support did not produce any tendency to weakness. Prices, on the whole, are firm; and what few changes have taken place in quotations are all for the better, with only one exception. Gaslight "A" has recovered the point which it lost the week before, and commanded pretty steady figures throughout the week—having been done at 237½ on both the opening and closing days. The demand manifested for high-class investment securities caused a demand to some extent for the debenture and preference issues, which had quite their full share of the week's business, and changed hands at good firm figures. South Metropolitans show a very slight increase in activity, and still exhibit an improving tendency. The "B" continues to advance by small steps of 1 at a time; and the debenture stock is fractionally higher *ex div.* The same may be said of Commercial debenture stock; and a few transactions have taken place in the old stock at good average prices. The Suburban and Provincial companies have been quite unnoticed, and remain unchanged. Among the Continental undertakings is the only instance of a retrogression; Continental Union having receded 1. Imperial Continental also exhibited a rather easier tendency at the close; the last mark being 224. Ottoman is ½ better. The Indian and South American groups are fairly steady; but nothing better. Very few transactions have been effected in Water securities; and those were at poor prices. In point of quotation, Chelsea comes out better *ex div.*; but changes in the rest point the other way.

The daily operations were: Business in the Gas Market was comparatively speaking fair on Monday. Quotations were firm and unchanged. There was rather less doing on Tuesday; but the general steadiness remained unaffected, while Ottoman rose ½. Wednesday was quieter in a marked degree, and prices were not at their best. Continental Union fell 1. On Thursday business was almost entirely in the Metropolitan Companies, and prices were very favourable. Gaslight "A" and South Metropolitan "B" rose 1 each. Friday presented no special feature, except the *ex div.* changes in quotation. Grand Junction Water fell 1. Saturday was very quiet, as usual; and nothing moved either way.

ELECTRIC LIGHTING MEMORANDA.

The Meeting of the American Institute of Electrical Engineers—The Central London Subway Bill—The Great Brush Lighting Demonstration—The Fortunes of the House-to-House Company.

THE American Institute of Electrical Engineers—one of the two organizations which represent the personality of the electric lighting industry in the States—has met in New York, when Professor Graham Bell, of telephone fame, was elected President for the ensuing year. Electric light men do not monopolize this Association; but most of the interest in connection with matters electrical now-a-days is bound up with the subject of the uses of high potential currents, whether for lighting, motive power, or welding; and therefore all electricians who are not merely telegraphists meet on common ground in these conventions. At the meeting now under notice, however, surprisingly little was said about electric lighting pure and simple. We have no explanation of the fact to offer; but so it was. The most striking of the technical transactions of the meeting was a lecture by Mr. Nicola Tesla on "Experiments with Alternating Currents of High Frequency," in connection with which some truly wonderful lighting phenomena were exhibited. The current employed in these demonstrations alternated 20,000 times per second; and in one experiment a difference of potential amounting to 250,000 volts was established. Geissler tubes and incandescent lamps were lighted brilliantly without contact, by merely placing them in the field of excitation. At present the difficulty of insulation stands in the way of the practical production of light by Mr. Tesla's method; no known materials being capable of preventing the discharges, which occasionally fuse everything in their path.

The event of the week for English electricians has been the passing by the House of Lords of the preamble of the Bill for the Central London Electric Railway which is to run from Shepherd's Bush to Cornhill, along the line of Oxford Street and Holborn. This is an even more ambitious scheme than the

one rejected last year; being 6 miles instead of 4½ miles long, and providing more accommodation for the travelling London public. The true reason for the acceptance of the Bill this year is probably the timely publication of returns relating to the City and South London Electrical Subway, which is earning money, and is reported to be likely to do well. The convenience to the London public of additional speedy means of transit through the middle line of the Metropolis, now only practicable for road vehicles and foot passengers, will be enormous; and nothing could please us better than to see electricians reaping, in a field of their own marking out, those profits and that interesting employment which we are persuaded that they will never glean from artificial lighting. In conveying passengers to different parts of London underground, the electricians will hurt nobody, and will be regarded as public benefactors; whereas their incursion into the domain of lighting has already been marked with the ruin of many trusting investors, and will yet entail disappointment upon more. The last expression of opinion is, of course, our own. We do not expect that it will command universal acquiescence.

It wasnot surprising that when it was announced in the London newspapers last Thursday that at length the Brush Company had so far completed their arrangements for carrying out their contract for lighting a portion of the City that they intended to turn out the gas for an evening—"not to definitely begin the work of lighting, but to show the Commissioners of Sewers what sort of light would be given,"—some of the editors of these organs of opinion were quite hopeful of the experiment. That the Brush Company, after five or seven years' beating about the bush, should be able to light up 26 arc lamps in Queen Victoria Street is, of course, a brilliant triumph for modern electrical engineering; and in this respect we are quite ready to admire it. It is to be hoped the City authorities will be satisfied with what they are to get for their money. A midsummer night, with a full moon, is naturally the best time to display electric arc lamps when placed rather far apart alongside a very wide thoroughfare. One can, under these conditions so fully realize the scene at any time between five and seven o'clock on a winter's evening, with a thick fog lying over the river, and the usual race of cabs out of the City meeting the van traffic over Blackfriars Bridge, and the throng of foot passengers hurrying off to the stations and the trams over the river! Truly, if the Brush Company know nothing else, they seem to know how to "play the game" with the Lord Mayor's "Pioneers" and the Commissioners of Sewers. Of course, there will be no savour of champagne supper clinging to the newspaper notices of the success of the experiment when these are served up in the inevitable prospectus.

The third ordinary general meeting of the House-to-House Electric Light Company has been held; and the proceedings threw further light upon the question of the progress of electric illumination in the suburbs of London. The mains of this particular speculation are nine miles in length, and take in the best of the Earl's Court region of Kensington. These mains are stated to supply 16,144 lights in 304 houses; but the particulars of revenue and expenditure are not satisfactory. All expenditure up to Sept. 30, 1890, was booked to capital account, as until then the business was supposed to be in course of establishment. Afterwards the report claims a small profit on revenue account, of £385, which is carried forward. But the Chairman, in moving the adoption of the report and accounts, did not speak very hopefully to the shareholders. He had to admit that the progress of the business of the Company was not quite so rapid as had been expected; and he talked ominously of the necessity of effecting economies in the working. The City office has been closed; and the draughtsmen and canvassers at Kensington are now dispensed with. The establishment charges have been reduced, and the fittings business handed over to a separate Company. There has been a difficulty in raising the additional 7 per cent. cumulative preference capital sanctioned by the shareholders last December. Mr. Hammond, cheerful as ever, told the meeting that he thought the prospects of the concern "very encouraging;" but in the same breath he blamed the Board of Trade for interfering with the work of the Company. What would these promoters of electrical companies that hang fire do if there was no Board of Trade to saddle with the odium of every failure? It may be noted that the capital receipts of this Company have been £57,635, of which ordinary shares stand for £26,610, and debentures for £30,000. The debenture-holders must be singularly complaisant.

The Funeral of the late Mr. Henry Cockey, whose death at the advanced age of 81 was recorded in our last issue, took place, as then briefly recorded, on Monday, the 22nd inst., amid general manifestations of the respect and esteem in which he was held in the town with which he had been so long associated. The body was borne by eight of the old employees of the firm of which the deceased was the Managing Director; and it was followed by his relatives and personal friends, among others, by the Directors of Messrs. E. Cockey and Sons, Limited (with the Manager and Secretary and about fifty workmen), those of the Frome Gas Company, and a deputation from the South-West of England Association of Gas Managers. The interment was witnessed by a large assemblage of persons.

THE RESTORATION OF GAS LIGHTING.

It has become so much the fashion to adopt electric lighting for modern buildings of an "advanced" type, that an example of the kind the architect whereof has been content to use gas lighting is worthy of at least passing comment. And when gas lighting is seen to be employed intelligently, and with due regard to the resources of the latest art in the application of gas for this purpose, the duty of recognizing the architect's independence becomes a pleasure. Such pleasure was ours in studying, through our contemporary the *Builder* of the 20th inst., Messrs. Gibson and Russell's plans of a municipal lodging-house for men, to be erected by the London County Council on a site recently purchased and cleared in the neighbourhood of Drury Lane. The circumstance of such an authority requiring the services of architects for such a purpose is, we suppose, a sign of the times. Hitherto municipalities have been more solicitous to build palaces for themselves and offices for their departments than lodging-houses for the poor and shiftless within their borders. It is not for us to discuss the principle of the new departure on the part of the London County Council; except to remark that it may prove the beginning of a policy of which no man can foresee the end. The experiment may not be continued to any extent; but if it succeeds in the example now under notice, it will be interesting to see where a municipal authority can draw the line in the matter of providing improved dwellings for the people. The purpose of this article, however, is not to debate a point of Sociology, but to bring into prominence some details of the system adopted by Messrs. Gibson and Russell for lighting, heating, and ventilating a perfectly modern building of a most interesting character, which may not only form the pattern of many more buildings in different parts of London and our large provincial centres of population, but may also strike the key-note of a new fashion in the devotion of special care, on the part of architects generally, to a class of responsibilities of which they have hitherto been careless or neglectful. Messrs. Gibson and Russell have done their utmost, in the manner of the publication of their designs, to concentrate attention on these matters. They have not reproduced a drawing of a single moulding, nor have they drawn anything purely for effect. They had to plan a healthy, useful structure for a special purpose in a particular locality; and they have done it without overlaying their work with meaningless ornament. At the same time, the building has a character of its own that redeems it from being commonplace. Its most conspicuous features, however, are internal, and are precisely those indispensable arrangements for lighting and ventilating in which we are peculiarly interested.

To begin with, we have a block 122 feet long by 73 feet deep, which is practically governed in all its dispositions by the dormitories, which are taken as the principal part of the building. These dormitories are ranged in three stories of galleries round a central well. In these galleries, and adjoining the external walls, are the sleeping cubicles, each measuring 6 ft. 6 in. by 4 ft., and 7 ft. 7 in. high. Every cubicle has its window, with a fresh-air inlet underneath; the air current passing over a coil of pipes warmed in cold weather. The cubicles are entered from the galleries; the inner well being surrounded with an unclimbable iron railing, and covered with a skylight. All the lighting is done from this well. Ventilating gas pendants, of the recuperative type of burners, hang down from the roof. This class of gas-lamps is employed throughout. There being three storeys of galleries, three of these gas-lamps are hung one over another, at the ceiling levels, in a stirrup ventilating-tube, which ends in a discharge-box immediately under the main extractor-cowl, where it is fitted with mica flap-valves to prevent reversal of the current. The dining-room and day hall, and other ground and first floor apartments are lighted with recuperative gas-lamps discharging into a ventilating-trunk which runs horizontally, under the concrete and iron ceilings, the whole length of the rooms to the main chimney, where it is led into a casing that surrounds the smoke-flue. As it is necessary, in a building intended for this purpose, to keep every appliance of the simplest character, no refinements have been attempted in the cooking-range, which has a hot-plate 50 feet long, or the open fireplaces. As there will always be fires going, the necessary draught in the uptake air-flues can be relied upon for all seasons of the year. Air-inlets to the day rooms are made underneath the windows, as for the cubicles, with a similar disposition of hot-water pipes to warm the current in cold weather. The foul air is to be extracted by the same trunk that takes off the products of gas combustion; mica flap inlet-valves being fitted at intervals along its length. At the same time, full advantage is taken of the natural ventilation of open windows and skylights, which in summer time will supplement the special air inlets and outlets.

The architects of this novel building not only use gas for lighting, but also draw upon the gas-works for materials of construction. Coke breeze concrete is adopted throughout for the fireproof floors and the flat roofs, "on account of its lightness, efficiency, and economy;" and concrete is largely employed for lintels of windows and other openings. As in all probability coke will be mainly burnt in the open fireplaces and cooking ranges of this large establishment, the chimneys will be practically smokeless; so that the building will not only be a pattern

of its kind, and a vast improvement upon the squalid tenements which it has displaced, but will also be an example of the different ways in which gas, and the products of gas-works, can be made to minister to the amelioration of the lot of the homeless and houseless who are dependant upon a local authority for shelter. Indeed, the natural reflection of a reader of the provisions thus made for the class of the town population which is just above that of the "casuals" whom the workhouse accommodates, is one of regret that the larger order of "jerry" builders who provide "genteel villa residences" for middle-class householders cannot be compelled to pay equal attention to the requirements of their customers.

It does not lie within our province to describe the arrangement of lavatories, laundries, &c., made by Messrs. Gibson and Russell in connection with their model lodging-house; our object being mainly to call attention to the good use made in this building of gas for the purpose which it has never yet ceased to serve with economy and reliability. The County Council could not afford to lay on electric lighting to a Drury Lane lodging-house; and fortunately so for the architects, who have consequently been free to demonstrate the natural and most convenient connection which exists between gas lighting and ventilation. It is a coincidence that the same week which gave publicity to this newest plan of applying "the light of the present" to a social and sanitary requirement of the day should have seen the publication by the *Daily Graphic* of a description and comment by Mr. Jennings, M.P., of the ventilating arrangements of the House of Commons. These, as most of our readers are aware, were designed by the late Dr. Percy, and comprise a draught furnace, burning in the Clock Tower, for drawing air through the House; the fresh-air supply being filtered through cotton wool, and cooled in summer by passing over blocks of ice, while in winter it is warmed by hot-water pipes. Now, it is a remarkable fact, that, although the House of Commons is lighted by incandescent electric lamps, the complaints respecting the defective ventilation of the House itself, as well as the lobbies and committee-rooms, grow louder and more insistent every day. It is the same at the Law Courts, which are also lighted by incandescent electric lamps. Both these great public establishments, erected for the accommodation by day and night of the highest intellects of the realm while engaged upon the nation's business, are reeking receptacles of foul air, in which every man is a nuisance to his fellow. Foul animal odours, the stale smell of leather, papers, clothing, and heated humanity render attendance at either building penible in the extreme. It has been said that a digestion capable of assimilating any number of dinners—good, bad, and indifferent—is as necessary as a keen intellect to the man who would rise in public life, and sustain the burden of eminence; and the remark has as much justification as usually belongs to smart sayings. For unless a man enjoys good bodily health as well as possesses superior mental powers, he will be unable to bear the stress of competition through which superiority becomes manifested. There can be no reason, however, for superadding to the qualifications for success in political or legal life an organism capable of resisting insanitary surroundings. But this is what the actual condition of the House of Commons as well as the Law Courts amounts to. We do not say that incandescent electric lighting is directly responsible for this state of things; but the fact remains that matters in these examples of bad ventilation have steadily grown worse, notwithstanding the introduction of the new method of lighting from which so much, in the sanitary way, was expected.

As we pointed out once in regard to the lighting of the lecture theatre of the Society of Arts, so it is at the Law Courts and at St. Stephen's—the use of incandescent electric lighting is coincident with an execrable condition of the atmosphere of the interiors affected. The fact is undeniable; let the physicists and electricians explain it as they please. It is not here a question of delicate chemical or biological testing; the physiological test is ample and conclusive. Judge after Judge driven from the Bench; Counsel incapacitated; litigants, witnesses, attendants nauseated—such is the tale at the Law Courts. At the House of Commons matters are quite as bad. It is only necessary to put one's head inside the lobby on a sultry evening to get a whiff of air that could only be described by the pen of a Smollett, who exposed so uncompromisingly the filthy condition of the ships of the Navy in his time. The probability is that Messrs. Gibson and Russell's common-lodging-house in Drury Lane will turn out to be salubrious and sweet-scented in comparison with these magnificent structures. We desire, however, to take nothing for granted in regard to such a matter; and it is to be hoped that when everything is started, the architects will adopt measures to satisfy themselves with regard to the proper working of their lighting and ventilation devices. So important is the establishment of sound practice in this matter, that we intend to keep the subject in view, and procure further information respecting it at the proper time.

The Ventilation of the House of Commons.—A Select Committee, consisting of the Right Hon. D. R. Plunket (First Commissioner of Works), Dr. Farquharson, Sir Guyer Hunter, Sir Henry Roscoe, and Mr. R. Power, has been appointed to inquire into the ventilation of the House of Commons.

TECHNICAL RECORD.

THE RELATIVE MERIT AND COST OF GAS AND ELECTRICITY FOR LIGHTING PURPOSES.

At the Annual Meeting of the Incorporated Association of Municipal and County Engineers, held at the Institution of Civil Engineers, Great George Street, Westminster, last Friday—the PRESIDENT (Mr. T. de C. Meade) in the chair—a lecture on the above subject was delivered by Mr. W. H. PREECE, F.R.S., the Chief Electrician to the Post Office. The following is a full report of his remarks:—

Mr. PREECE said: I have the pleasure this morning of bringing before you the subject of the relative merit and cost of gas and electricity for lighting purposes; and, as a practical man speaking to practical men, I propose to consider the matter solely from a practical point of view, and to deal rather with the financial aspect of the question than with mere technics. Of course, I shall have to deal with figures, and figures are proverbially dry. It has been said that you cannot extract a joke out of figures, and that you can always manipulate them to suit your own particular views. Neither statement, however, is quite true. As regards manipulating figures to suit one's own ideas, I daresay it will be said I am going to do very much that kind of thing; but I am addressing you to-day—if I have any prejudice—as a gas shareholder, and not as an enthusiastic electrician.

Comparisons of cost are generally fallacious, because the comparison depends so very much upon the point of view. The questions which we have to decide are generally such as this: What is the capital involved in any particular industry? What is the profit derived? What has the consumer to pay? Well, I told you I am going to address you as a practical man; and I am not going to bring before you any fanciful figures. They are figures which you can all get for yourselves; and you will be able to check the deductions I am going to make. Now I have taken the case of Manchester; for the simple reason that I have more authentic records of what is done there than in any other town. From the records of the Gas Department of that city, it seems that a ton of coal produces 9611 cubic feet of 20-candle gas. Of course, that is rather above the average candle power throughout the country; the average is not more than 15 candles. Since this is the quantity of gas produced by a ton of coal it follows that 1 lb. of coal will yield 4·29 cubic feet of gas; and if 4·29 feet of Manchester gas is burned per hour, we get an illumination of 17·2 candles. In drawing a comparison between gas and electricity, I must use one technical term. It is a term that has come into very general use and will have to be understood—even if it is not understood now—by every engineer, whether electrical or municipal. That term is the "watt." A watt is a unit of power. The common unit of work with which we are most acquainted is the foot-pound; and the unit of power we know best is the horse power—that is, the power exerted that will raise 33,000 lbs. 1 foot per hour. In other words, you may say a horse power is the power which will raise 550 lbs. 1 foot per second. Now a watt is the power which, in the metrical system, will raise—I forget the exact value in grammes per centimetre; but it is that exact power which is exerted by a current of electricity called an ampère when flowing through a resistance of 1 ohm for one second—it connects mechanical power with electrical energy. So, in the use of electrical energy, if we burn in a steam-boiler 7 lbs. of coal per hour, we shall get 1¼-horse power. But represented in watts, it means that we shall produce 1000 watts; and 1000 watts is called a kilowatt. We saw that 1 lb. of coal turned into gas will give us an illuminating power of 17·2 candles. I must here observe that we can use electrical energy in two forms—one in the arc lamp, which we see illuminating streets a good deal, and the other in the glow lamp which we use in our houses. Now 1 lb. of coal burned in a boiler to produce steam will supply electrical energy which will give, if burned in the form of a glow lamp, 48 candles, and if in the form of an arc lamp 288 candles. So there we start with the first theoretical fact that I wish to bring before you.

But now we will come to hard facts. In Manchester, during the twelve months ending the 30th of March, 1890, the income derived from gas was £434,351; and the expenditure was £360,804—showing a balance of £73,547, which was devoted to meeting interest on loans, depreciation, cost of public lighting, &c. But from that fact, I derive this—that the cost per 1000 cubic feet of gas was 2s.; and therefore 2s. produced an illuminating power of 4000 candles. I am obliged to use an estimate; for the simple reason that at present the Corporation of Manchester have not established a central electric lighting station. They have obtained a Provisional Order to enable them to do so; but they are now considering whether they shall carry out the Order themselves, or transfer their powers to another body. In making an estimate of the cost of producing electricity in Manchester, we have to take the experience of other places; and on this point of cost, there are perhaps more reliable, accurate, and truthful facts than on anything else connected with electricity. The Board of Trade exercises such a powerful control over the electric lighting interest that there is no "hanky-pankying" with the accounts. They must show

the cost of production; and they are within the reach of everyone. We have at the present time a great many of our post-offices lighted by electricity. I have a large central station at the General Post Office, and have there a plant by which we are going to produce sufficient power to illuminate 10,000 lamps. We are laying down another central station at Coldbath Fields—now called Mount Pleasant—where we shall be able to generate electricity for a further 10,000 lamps. From my own experience there is not a shadow of doubt that at the present moment we can produce a kilowatt-hour (which is the unit of energy to compare with 1000 cubic feet) for 4d. Taking this 4d. it means this: That we can produce 4000 candles by gas for 2s.; by an arc lamp, for 8d.; and by a glow lamp, for 4s. So that you see on these facts—I will not call them estimates; they are facts—that the theoretical limit of light produced is twice as much by the glow lamp as it is by the gas-lamp. These are theoretical limits; they are not practical ones. We all know this, however proud we, as gas engineers, may be at producing gas of 20-candle power, that, when we go to the shops and houses of the consumers of gas, the 20 candles are greatly diminished. This is a very important question; but it is one that, some six or seven years ago, concerned us very much at the Post Office. Mr. Vernon Harcourt and I devoted a considerable amount of time to experimenting on this question. Mr. Harcourt found that, an ordinary open burner, supposed to consume 5 cubic feet of gas per hour, and which ought to give a light of 15 candles, really only gave practically 10 candles—due to dirt in the burners, and probably to the draughts and the flickering of the light preventing the proper combustion of the gas. This *pro ratâ* value found for London is equally true for Manchester or anywhere else; and the result is that, to obtain 4000-candle power, you must practically add 30 per cent. to the cost of the gas. By-the-by, I ought to say that this depreciation in the value of light is not only true in the case of gas, but it is also true to a certain extent in the case of electricity. The lamps that are sold will give you, when they are new, 16-candle power; but in the course of 200 or 300 hours, there is a peculiar action progressing between the current of electricity which is flowing and the carbon filament, which causes the latter to evaporate—it flies away in straight lines, and is deposited as a thin coating on the glass bulb, obstructing a certain amount of light. You have also a quantity of dirt accumulating on the exterior of the glass bulb; so that you have a depreciation of the value of the electricity, although not so great as in the case of gas.

I should mention that, in the remarks I am now going to make, I draw no distinction in light-giving power, when I speak of a lamp, whether electric or gas. Five cubic feet of gas will give practically 10 candles; 33 watts of electricity in its normal condition will give 10 candles. So, by taking your calculations on 33-watt (or 10-candle power) lamps, you draw a very fair comparison between gas and electricity when used as an artificial illuminant. These figures want further correction. There is one element in gas which is a very serious loss indeed—that is, the tremendous waste of gas which occurs through lights being left burning unnecessarily. The result is that quite 20 per cent. of gas is used more than is essential; and it is brought out as a very striking fact by this—that, taking the nine principal towns in this country, the average number of hours of burning gas is 600; while the average number of hours for electricity is 460. This last figure is taken from 200,000 lamps which are now alight in London. Well, with gas you have a tremendous waste, owing to these burners being left flaring about; but with electricity we have no such waste. By simply turning a tap we can put the light "in" or out; while with gas you each time require a match. There is a species of instinct that teaches the consumer at once that, if he wants a light in a particular place, with electricity he has only to turn the tap; and when he has done with it, he has simply to give it another turn. The result is he gets no waste. Now it comes to this, that the comparison between gas and a glow lamp is not 2s., but the practical figure of 3s. 8d. Now we can prove this. The average amount paid in the nine chief towns of this country per gas-burner is 9s.; while the average price of gas is 3s. per 1000 cubic feet. The average price of the 200,000 lamps that are lighted in London is 10s. per lamp. So that we have these two facts—that the average price paid by the consumer for gas is 9s. per annum; and by the consumer of electricity, 10s. This is a startling figure, because most people are under the impression that the cost of the electric light is very much greater than gas; and I have been myself much surprised to find that the price I pay in my house (where I generate my own electricity, and have done so for seven or eight years) was so very small. I have a gas-engine, accumulators, and over 70 lamps fixed in the house; and I am paying no more than I did for gas lighting—the price per lamp being less than 10s.

I have taken all the electric light companies in London, and have tabulated the revenue derived by each Company per lamp per annum—that is, a 33-watt lamp. The Metropolitan Electric Supply Company derive a revenue of 12s. per lamp; the Chelsea Electricity Supply Company, 8s. 6d.; the Kensington and Knightsbridge Company, 9s. 2d.; the House-to-House Electric Supply Company, 11s. 6d.; the St. James and Pall Mall Electricity Supply Company, 9s. 6d.; and a Company not in London—that is the Brighton—8s. 6d. The average amount paid for 200,000 lamps is therefore 10s., compared with 9s. for gas. Well I have verified this ratio between the two. Taking two years' experience with each light at the General Post Office, we find that gas costs us 18s. per lamp, and electricity 22s.; the ratio being 9 to 11, and not 9 to 10 as in the figures I have given you. Taking Manchester, where the gas is cheaper than in London, it appears from the returns that the average price paid per lamp for gas is 7s. 6d. per annum; while taking the cost of the production of electricity—viz., 4d.—the revenue that Manchester will derive from electric lamps will be 8s. 4d. The rates of charge for electricity vary very much. In London the private companies are charging in some instances 7½d., and in others 8d. In Bradford, they commenced by charging 5d.; and they have raised it to 6d. In Newcastle, they charge 4½d., and allow large discounts. At the Post Office in Newcastle we are large users of electricity; and I think we have a discount off the 4½d., which makes the cost approach very closely to that of gas. In the case of factories, where they have isolated installations, electricity is really cheaper than gas. I have the figures from a large mill at Bolton, where they have had the electric light in use for upwards of six years. While they were using gas, the cost per lamp came to 5s. 6¾d.; since generating their own electricity, it works out to 4s. 0¼d., which is a considerable reduction. Those who are acquainted with Manchester know that under the Exchange there is a large restaurant that used to be unbearable when it was lighted with gas. The manager, however, replaced the gas with electricity; and he finds that he not only saves £800 a year in the cost of illumination, but he has probably doubled the business by clearing the atmosphere and enabling his customers to have their meals in comfort.

So far as figures go, I think that I have given you rather hard facts, to show that there is not much difference between the cost of electricity and gas. In my own case, I burn gas; but I do so in the garden, and extract from it that which I want—viz., light for my house. Take 25 cubic feet of gas, and burn it direct, you will practically get only 50 candles by means of the burners, from which I have drawn my calculations; but if you burn 25 cubic feet of gas in a gas-engine, and get horse power, and convert it into electrical energy, this will give you 160 candles. Therefore, with a little additional expenditure and care, you are able to use gas, and get treble the light-giving power in your house. I ought to have mentioned before that one of the great merits of electrical machinery over gas plant is the small space that the former requires. In the case of gas plant, 100 feet by 50 feet. is I believe, needed for every million cubic feet of gas produced per annum; but a similar space is quite sufficient to light up the whole of one of our big towns by means of electricity.

We must not neglect other points. When we adopt electric lighting, we remove from our midst a source of deterioration of our goods and chattels, and books and pictures, and that which dirties our ceilings; we are introducing something that encourages cleanliness; and we add materially to our comfort, and consequently to our cheerfulness. As to the security of our buildings, electric lighting is not absolutely safe. It is all nonsense to say that it is perfectly safe; it is not so. Carelessness will cause fire as in the case of gas. It requires the usual care, which engineers know so well how to exercise. The question of health, however, I want to thrust down everybody's throat. We find in the Savings Bank Department at the General Post Office that the cost of the electric light is paid for by the increased service we get out of our staff. The introduction of the electric light there has diminished the number of hours of absence by two hours per head per annum. This diminution, put down at 10d. per hour (which is the ordinary rate of pay for overtime in the Government service), saves us £680 per year alone. The electric light costs us £700; so that really the cost of lighting is only £20 a year. I succeeded in putting the electric light into the General Post Office just before last Christmas; and the Controller told me that the light on Christmas evening enabled them to get through their work quicker than in the previous year to an extent equal to 200 men. The sanitary aspect of electric lighting is also of great importance to engineers. The impurities emitted by gas into the air are poisonous; and gas burned in a bed-chamber is as great an evil as bad water and bad smells.

There is another point connected with electric lighting—it is not a luxury. A common statement made, when matters of this kind are argued by local boards and other authorities, is: "This is a light of luxury. We don't want this thing in our midst; it is only the rich man who can afford to pay for it." The electric light, I contend, is the poor man's light. If you can give a poor man a light for 8s. 4d. a year, as in Manchester, think of the benefits he will derive, living as he does in a close, ill-ventilated chamber, where gas and oil are really filthy. Besides, the price of gas is going up through strikes, labour disputes, and so on; while the price of electricity is coming down. We can produce 1000 cubic feet of gas at 1s. 10d. (that is, taking 2d. off for collection and management), or perhaps as low as 1s. 7½d., 1s. 4d., or even 1s. But what can we produce electricity for? I have just been making an exhaustive inquiry as to the cost of electricity for the production of phosphorus and the decomposition of copper. These are industries where the use of the current is continuous; whereas in electric lighting, the load is irregular. Where the load-line is regular, as in works where phosphorus and copper are manufactured, you can produce electricity for ½d. per unit. It means this, that,

f we take the theoretical difference between gas and electricity, the equivalent of gas is produced at 3d.; so that we have the prospect before us of producing electricity at ½d. per unit, against 3d. for gas. There is one reason why gas is still ahead of electricity. It is that there is such a market in this country for residuals. The price obtained for coke, ammoniacal liquor, and other products, practically reduces the price of coal to the gas manufacturer to something like 4s. per ton. In London we have to pay for Welsh coal about 23s. per ton; and that is why in London electricity must cost more than gas for some time to come. I have been looking into the matter of the lighting of Malta and Gibraltar; and when we come to those places, where there is no market for residuals, there is no difficulty whatever on my part in showing that it is possible to produce electricity cheaper than gas.

I have now done, gentlemen. As I said at the beginning, I wished to place this matter before you as a practical man speaking to practical men; and I want you, if you agree with my calculations, to point out to your different authorities that their duty is to look to this matter of the introduction of the electric light—not only from a financial point of view, but from a political, as well as from a sanitary, point of view—and try to persuade them that the electric light is not the light of luxury, but the poor man's light.

A brief discussion followed the lecture. The President first moved a vote of thanks, which was seconded by Mr. Lemon, of Southampton. Mr. Brodie, of Whitehaven, asked whether Mr. Preece, in comparing the cost of the two lights in his house, included the outlay for the gas-engine, dynamo, and other plant. He also drew attention to the fact that Mr. Preece had taken the price of electricity at Newcastle for his comparisons; and there it was only 4½d. per unit, with a large discount. This was an unfortunate instance to take, as coal should certainly be cheaper there than anywhere else. What he should like to know was what would be the cost per unit at Malta and Gibraltar, where the cost of coal was greater. Mr. Fowler, of Stockport, observed that the remarks Mr. Preece had made as to the use of gas-engines for generating electricity were based on the use of ordinary coal gas. If Dowson gas were used, he apprehended the cost would be reduced to something like one-third, because this gas only cost 2d. or 2½d. per 1000 cubic feet.

Replying to the points raised by the various speakers, Mr. Preece said first with respect to the relative cost of gas and electricity in his house, he would cry "*peccavi*." He was now using exactly the same quantity of gas in the engine as he did previously for lighting direct with gas; but by means of the engine, he obtained three times the amount of light. It was not the first time the question had been put to him, "You, a business man, allow nothing for depreciation, nor for interest on capital?" He replied, "Certainly not. You do not allow for depreciation on your piano, or interest on the money paid for your pictures or furniture. Then why should I allow interest on the outlay for my engine and dynamo." As to the cost of coal in Malta and Gibraltar, he might say that the element of coal was not a serious item in the cost of the production of the electric light. The cost of coal per unit in London was about 1d.; but, as a matter of fact, the cost at the General Post Office was ½d., and that with best Welsh steam coal at 23s. per ton. Coal could be had at Malta and Gibraltar at 24s. and 25s. per ton; so that really there was no perceptible difference. There was no doubt whatever they could produce electrical energy by means of Dowson gas in gas-engines at one-third the price of illuminating gas. The most careful experiments had been made by Messrs. Crossley; and they stated that by Dowson gas it cost 1½d. for fuel per horse power per hour. The ordinary price allowed for coal was 2½d. per horse power.

The vote of thanks was passed by acclamation.

WESTERN (U.S.A.) GAS ASSOCIATION.

(*Continued from p.* 1254.)

At the close of the proceedings already reported,

Mr. J. Gimper, of Leavenworth (Kan.), read a paper in response to the question, "Does it pay to use inclined retorts in small gas-works?" He answered in the affirmative. He did so after practical trial; but he had been obliged to introduce modifications to enable the charging-waggons, &c., to be worked by one man. He tried taking off the gas from the upper, instead of from the lower end; but he was obliged to discontinue it by reason of the accumulation of pitch in the hydraulic main. The advantages secured by the system were: A larger capacity per retort, a great saving of labour, a better quality of coke, and more facility for removing carbon. The coal was raised by machinery to an overhead hopper, from which the charging-waggons were filled; and one man could attend comfortably to a bed of five retorts.

Discussion being invited, Mr. Dunbar said he failed to see where the saving of labour came in, as one man could work a bed of six ordinary retorts. Mr. Jenkins thought that this was a question of make per mouthpiece; and he said he would like some information on the point. Mr. Lansden understood that one man could work twice as many inclined as ordinary retorts. Mr. Boardman noticed that the retorts were contracted at the bottom; and he considered it would be better if they preserved an equal section throughout. Mr. Somerville had seen a drawing of a device patented by Mr. Mitchell, for displacing the heavy curved necks, or charging shoots, on each retort, and using instead a moveable light iron telescope shoot, which could be adjusted to the level of each retort. The President said that, if he were building a new retort-house and setting fresh retorts, he would certainly adopt the inclined system. He would not put them back to back, but sufficiently far apart to permit of the use of a contrivance like Mr. Mitchell's.

In replying, Mr. Gimper said he could not give much information as to first cost or working results just yet, as it was a new thing, and he had met several difficulties. The inclined bench certainly wanted more head-room than was to be found in some retort-houses. If the heats were good, and the coke well worked off, it came out easily; and his five retorts could be charged in seven minutes. The contraction at the lower end was no disadvantage at all. In any case, the coke had to be broken up before it would come out. He had no trouble from stoppages in the pipes.

Mr. William Tracy, of Alton (Ill.), followed with a paper describing the difficulties he encountered on taking charge of the Gas and Electric Lighting Company at Alton, about two years ago. The gas plant had got into a bad state; and after remedying this, he was able to make a substantial reduction in price—bringing it down to 10s. 6d. per 1000 cubic feet, with 2s. discount for cash, and a further allowance of 4s. 2d. for gas used in stoves during the six summer months. He then began an active canvass in the stove trade; and in the first season raised the number in use from 15 to 67. These consumed about 2000 cubic feet per month each. The importance of looking after a stove after it has been fixed, and seeing that it is properly and economically used, was illustrated by actual examples from practice. He turned his attention to coke next, which only realized 1½d. to 2d. per bushel. He substituted Youghiogheny for the native coal hitherto used, advertised freely, and gave away samples to likely customers; and in a few months he was able to sell as much coke as he could make for 4½d. per bushel. He had bought a horse and waggon for delivering coke, and was just fitting up a breaking machine. The substitution of good for cheap coal had paid in every way. He concluded by a reference to his electric light department, which had caused him some trouble on account of improper construction in the first place.

A paper by Mr. Sylvester Watts, of St. Louis, on the economic results of electric light investment, was next read. The author stated that the money invested in electric lighting during the last eight years was almost a total loss. The original investors had been wiped out; and he thought the present ones would be bankrupt in five years. Some had survived by means of demands for electricity for power purposes, and by the profit made by selling complete plants to timid gas companies. He counselled the latter to have nothing to do with electricity. The arc light was cut down by competition to a non-paying basis; and the incandescent light was so costly in distribution that it would never be permanently used to any great extent, while the cost of renewing lamps was equivalent to an additional 7½d. per 1000 cubic feet for gas. A 16-candle power lamp would last 600 hours, and cost 1s. 10½d. The cost of producing electricity was already as low as was possible with present means. If gas shareholders would be satisfied with 6 per cent. dividends, the selling price of gas could be so reduced as to bankrupt all electric lighting companies in the district. Estimates were included in the paper, showing the net cost of a million cubic feet of coal gas as £62; whilst that of an equivalent quantity of electricity on the incandescent system would be £101. It was also shown that coal gas was cheaper than crude water gas as a fuel. The cost of the 2¼ million cubic feet of the latter, which would be needed to represent in heating value the million cubic feet of coal gas, would be about £87 10s.

It was agreed that, as Mr. Watts was not present, the paper should not be discussed.

(*To be continued.*)

THE PHYSICAL CONDITIONS EXISTING IN SHALE DISTILLING RETORTS.

A paper on this subject was read at a recent meeting of the Glasgow Section of the Society of Chemical Industry, by Mr. T. J. Rowan; and the conclusions arrived at by that gentleman are interesting as throwing some light upon the temperatures prevailing inside an ordinary gas-retort when charged with coal. The author's opening sentences, to the effect that the physical conditions existing in shale retorts have not been very accurately or minutely observed, and that a great deal seems to have been taken for granted, might be appropriately applied to coal-gas retorts. As the experiments were tried for the most part upon retorts constructed by Messrs. Armour, of Hermand Oil-Works, a description is given of the original vertical retort, the Henderson, the Young and Beilby, and lastly of the Hermand retort, with a view of showing the peculiar features and advantages claimed for the latter. In form it possesses some similarity to the Young and Beilby retort; being vertical, tapering from bottom to top, and having a curved discharging shoot at the

bottom. But it is somewhat longer, and has a greater degree of taper; is built entirely of fire-brick, instead of having the upper half of cast iron; and is heated entirely by waste gases burnt in a continuously ascending spiral flue surrounding the exterior of the retort and having a total length of 211 feet. It is claimed to afford twice the heating surface of the Young and Beilby retort. According to a number of observations taken with a Siemens copper ball pyrometer and a Murries pyrometer, it appears that the temperature in the spiral flue commences at the bottom at 2000° Fahr. or more, and gradually decreases to 900° Fahr. at the exit flue at the top. With these conditions on the outside, attention was directed to the charge of shale inside; pyrometers having stems as long as 18 feet being used for the lower part of the retort. A pyrometer inserted into the hopper just after a draw and before fresh material was introduced, showed a temperature of 450° in half an hour. A pyrometer was placed in the middle of a charge of green shale, with 3 feet of the stem inside the hopper; and notwithstanding the heat of the latter, the lower limit (300°) was not passed for nearly two hours. In another hour the pyrometer dropped with the charge to its full length, by reason of a "draw" being made from the bottom. The temperature then rose to 350°, but fell to 320° on the introduction of a fresh charge. It should be explained that the Hermand shale retorts contain about 3 tons each, and that a portion only is drawn from the bottom at intervals. The whole charge sinks, and thus makes room for a portion of fresh material to be added at the top. The pyrometer gradually rose to 500° during the next hour; remained nearly at that for three hours; and in the course of the next two hours slowly rose to 750°. Subsequent tests showed that the shale does not reach 1000° till it has descended about 6 feet into the retort. In the next experiment, a long pyrometer was introduced to a depth of 10 feet when charging. The lowest limit of the pyrometer (1000°) was not reached for five hours, and then the temperature rose to 1100° during the next hour. The temperature ranged not far from 1100° during the seventh and eighth hours, gradually rising to 1140° in the ninth hour, at the expiration of which a "draw" was made, causing the instrument to drop 2 feet. In this position it remained for six hours, showing a gradual rise up to 1200°. A second "draw" caused the pyrometer to fall to its full length of 18 feet. Here it remained for nearly twelve hours, fluctuating between 1100° and 1190°. In another series of observations, the temperature at 8½ feet from the top was found to average 1100°; after dropping to 12 feet it ranged rather lower; at 15 feet it was 1130°; and at its full depth, 1124°. The remarkable result was thus arrived at, that with an exterior temperature of 2000° or so at the base of the retort, that of the material inside did not exceed about 1150°.

Several observations were made as to the temperature of the escaping oil vapours, which passed off at the top after traversing the fresh material. They ranged from 220° just after the introduction of a fresh charge, to 450° just before the next draw. The cooling effect noticeable after a fresh charge was thought to be due to the dropping of the shale into a hotter region, leading to the production of a larger quantity of gas, rather than to contact with the cold shale.

The author holds that "these results offer a very plain confirmation of the chemical or physical law that change of physical condition from solid to liquid, or from either to gas, is invariably accompanied by the absorption of heat. . . . They also illustrate the fact that as long as such a process is in operation, it is practically impossible that there can be any considerable increase of sensible heat." It will be remembered that Mr. W. Foulis, in his inaugural address before The Gas Institute, in 1889, quoted some experiments showing that the temperature of the coal inside a retort during distillation is only about 1200°, although that on the exterior may be 2000° or more; and that Mr. N. H. Humphrys, in the course of the papers on the "Chemistry of Illuminating Gas" recently contributed to these columns, suggested the possible existence of a "gasification point," similar to that of the "boiling point" of water and other fluids. So that as long as coal was giving off gas freely, a limit of temperature would not be exceeded; just as water boiling at 212° did not rise above that temperature, but only boiled the faster, on addition of heat.

Electric Lighting in Belgium.—According to an address lately delivered by M. Wybauw, the Municipal Electric Lighting Engineer of Brussels, there are 544 arc and 9507 glow lamps in use in that city; 240 arc and 1481 incandescent lamps in Antwerp; 220 arc and 4931 incandescent lamps in Ghent; 384 arc and 2040 incandescent lamps in Liège; 665 arc and 2423 incandescent lamps in Verviers; 1500 incandescent lamps in Charleroi; and 1100 lamps in Ninove.

The Johannesburg Gas Company, Limited.—An extraordinary general meeting of this Company is to be held at the Cannon Street Hotel, on the 15th prox., for the purpose of considering certain proposals for the dissolution of the Company, and the transfer of its assets and rights to a Company to be formed in the South African Republic for the lighting of the town of Johannesburg by gas and electricity respectively, or otherwise for considering proposals in connection with the acquisition by the Company of the concession for lighting by electricity, and the increase, if necessary, of the capital, or the issue of reserve shares in consideration for, or in connection with, the acquisition of that concession; also for the purpose of adding to, repealing, or altering any of the provisions of the Articles of Association in such manner as may be found expedient.

REGISTER OF PATENTS.

Manufacture of Water Gas.—Von Langer, J., and Cooper, L., of Leeds. No. 7739; May 17, 1890. [11d.]

This invention relates to the production of water gas in cases where the generator gas obtained at the same time cannot be separately utilized. It is also intended to provide means for relieving the water gas of undecomposed steam.

For this purpose a recuperator is employed, in which the producer gases entering from the generator are burnt; and the products of combustion thus obtained are used for heating air. A portion is subsequently employed in the generator, while another portion serves to assist combustion in the recuperator. There is also employed a coke cylinder or stack, through which the water gas passes on its way to the scrubber, and which is intended to decompose any steam that may have been carried over by the water gas from the generator.

The water-gas plant may, therefore, comprise a generator provided with hot-air belts, which communicate with the hot-air chamber of the recuperator by means of valves; and a recuperator—preferably an upright recuperator of the class described in patent No. 6400 of 1890. If the producer gas escapes at the top of the generator, it is led through a valve to the top of the recuperator, and there burned. The gases of combustion pass down between the earthenware heating pipes into the chimney-flue; while the cold air enters the base of the recuperator at the side, and passes upward through the superposed blocks of horizontal pipes in a zig-zag line into the hot-air chamber, which supplies hot air both to the air belts of the generator, and to the combustion space of the recuperator. The hot water gas passes from the generator through a valve to the coke cylinder. It enters underneath the grate; then ascends through the coke (thereby heating it); and escapes from the top of the coke cylinder into the scrubber.

Regulating and Governing the Admission of Air and Gas into Gas Engines.—Griffin, S., of Bath. No. 10,952; July 14, 1890. [8d.]

This invention relates to an arrangement of valves and apparatus by means of which the volume of atmospheric air entering the motor cylinder of a gas-engine during the charging stroke, when the gas-valve is closed, may be diminished when the valve is opened; also to an arrangement by which the proportion of gas and air forming the working charge or explosive compound may be varied.

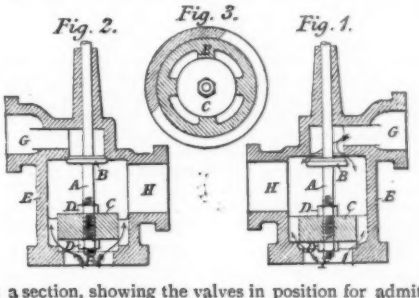


Fig. 1 is a section, showing the valves in position for admitting gas and air (or explosive compound) into the motor cylinder. Fig. 2 shows the gas-valve closed, and the air-valve fully open. Fig. 3 is a sectional plan of the air-passages past the valve C.

A is the valve-spindle, carrying the gas-valve B and air-valve C; the latter being adjusted by lock-nuts D. The casing E has three tubulars or openings—*viz.*, the air supply F, the gas supply G, and the delivery H leading to the cylinder. When the engine is running below its normal speed—*i.e.*, doing work—the valves, by the action of the governors, will be in the position shown in fig. 1. The gas passing by B, and the air by C, will mix in the passage H, and flow thence into the motor cylinder, where it operates in the usual way. When by reason of a decrease of work (or other cause) the engine exceeds its normal speed, the governors will raise the spindle A, close the gas-valve B, and at the same time fully open the air-valve C, as in fig. 2. Air alone now passes freely into the motor cylinder at each charging stroke of the piston, until the normal velocity of the engine is again reached, when air and gas are admitted as before.

It will be obvious that the governing mechanism which actuates the valve-spindle A, may be so arranged as to vary the position of the valves B and C in any desired proportion between that shown; the proportion of the explosive compound being relatively varied. The adjustment of the air-valve is effected by the lock-nuts D.

Treating Crude Blast-Furnace or Coke-Oven Oils, and Applying the Oils so Treated or Produced for Making or Enriching Illuminating Gas.—Staveley, W. W., of Pontefract. No. 11,195; July 18, 1890. [6d.]

This invention has for its object the production of an oil specially suitable for use as an enricher (as regards illuminating power) of ordinary coal gas, or for imparting illuminating power to water gas.

To effect this object, the patentee proposes that the crude, or once-run, blast-furnace or coke-oven oils, which contain varying quantities of the phenoloids (phenol, cresol, and their higher homologues), along with members of the paraffin series and pyridine bases, should be submitted to fractional distillation in an iron still or retort. When the distillation is carried on in a still not provided with means for dephlegmating, or fractionally separating the vapours arising from the distillation, the first 50 per cent. of the oily distillate which passes over from the still (any water being rejected) is collected in a separate receiver; and the distillation is then stopped. The collected distillate will be richer in light paraffins, phenoloid bodies, and pyridine bases than the original oil. Should the bulk of the distillate contain 50 per cent. of phenoloid constituents, it is suitable for use as an enricher of coal or water gas; or any part of the distillate which contains 50 per

cent. of phenoloid bodies may be set aside for the purpose. The part of the distillate which tests less than 50 per cent. of phenoloid bodies is redistilled; and the portions of the distillate testing 50 per cent. or over of phenoloids are again set aside. Or the crude or once-run blast-furnace oils or coke-oven oils may be distilled in an ordinary still or retort; the vapours passing from the still, before reaching the condensing coil or worm, being made to pass up a dephlegmating or fractionating column—similar in principle to the well-known Coupier's benzole apparatus, but constructed mainly of cast iron—whereby the heavier vapours are condensed, and flow back into the still or retort, the paraffins and phenoloid bodies with lighter boiling-points passing forward to the condensing coil or worm. In this method of working, the most volatile portions of the crude blast-furnace or coke-oven oils are obtained and concentrated in the first 20 to 50 per cent. of the distillate.

In order to more fully explain the invention, the inventor gives the following example: A sample of once-run blast-furnace oil testing 30 per cent. phenoloids and of a specific gravity at 67° Fahr. of ·974, distilled in an ordinary retort, thermometer in vapour, yielded—At 210° C., 5 per cent. of distillate; 220° C., 20 per cent.; 230° C., 30 per cent.; 240° C., 40 per cent.; and 250° C., 50 per cent. The 50 per cent. distillate contained 40 per cent. of phenoloids. This 50 per cent. distillate, on redistilling, gave 50 per cent. distillate (25 per cent. on the original oil) testing 50 to 51 per cent. phenoloids. This 50 per cent. concentrated phenoloid oil is suitable for use as an enricher of coal or water gas as hereafter described. Another sample of the once-run blast-furnace oil was distilled and the vapours passed through a dephlegmating column, when 100 parts of the once-run blast-furnace oil gave 50 parts distillate testing 51 per cent. of phenoloids and 47 per cent. of light paraffin oils and bases, along with 3 parts of water.

The patentee further remarks that it has long been known that illuminating gas could be obtained from crude blast-furnace or coke-oven oils by the process of destructive distillation which takes place when these oils or their vapours are passed through retorts, or other enclosed vessels, heated to a high temperature. Hitherto, however, it has not been found economical to use these oils for gas producing purposes on account of the small yield of illuminating gases obtained therefrom—mainly due to the large quantities of heavy hydrocarbons, paraffins, and phenoloid bodies, present in the oils. The heavy phenoloids yield, on destructive distillation, products of high-boiling points, but of little use for imparting luminosity to gases. But in the oil produced from blast-furnace or coke-oven oils by this invention, the heavy phenoloids and paraffins are present in much less proportion; whilst the lighter paraffins, and the more volatile and lower members of the phenoloid series of bodies, are present in much larger proportions. These lower members of the phenoloid series—phenol, cresol, &c.—yield on destructive distillation benzene, toluene, and other valuable illuminating agents, seeing that 65 per cent. of the luminosity of ordinary coal gas is due mainly to benzene and toluene.

The inventor considers this the important point in his invention—viz., the economical production of an oil containing phenol, cresol, &c., in large proportion, which, on destructive distillation, yield the valuable bodies benzene, toluene, &c., and which oil, in consequence of the presence, in large proportions, of these bodies, along with light paraffin, is much more valuable for use in the production of illuminating gas than ordinary coke or blast-furnace oils.

When it is desired to use the oil produced by this method in the manufacture of illuminating gas, the oil is passed direct into a retort, or other enclosed vessel, heated to a high temperature; and the gases produced by the destructive distillation of the oil are, after cooling, passed into a suitable holder or vessel for storing. Or (and the inventor prefers this method) the oil is passed in a stream *per se*, or as a spray, into a heated retort through which coal gas or water gas is passing. The vapours of benzene, toluene, &c., resulting from the destructive distillation of the oil are taken up and held as a permanent gas by the heated coal or water gas. When the oil is made by passing the vapours from the distilling oil through a dephlegmating column, as before described, the inventor prefers to collect only such vapours as pass over at, or under, a temperature of 220°.

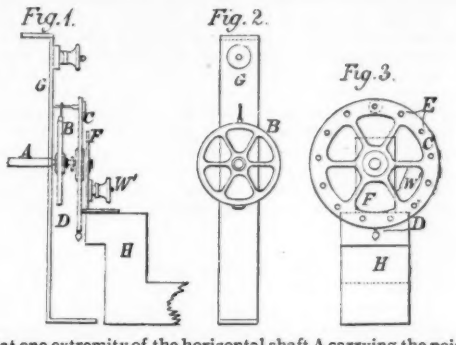
Gas Detecting and Recording Apparatus.—Pitkin, J., of Clerkenwell, and Niblett, J. T., of Greenwich. No. 11,101; July 16, 1890. [8d.]

This invention relates to improvements in the apparatus patented in 1889 (No. 4629), wherein the peculiar property of certain metallic substances—notably platinum black—in occluding and facilitating the combination of certain gases, and thereby causing an abnormal temperature in the neighbourhood of them, is employed in connection with metallic or other thermometers for giving an indication of the existence of a vitiated atmosphere or of a mixture of various gases. The improvements consist in adapting to such indicating thermometers, means for making a continuous record of the variations in the readings treated with the platinum black or similar material, which, by a comparison with the recorded readings of an ordinary thermometer, under the same circumstances, will give data for determining the percentage of any given gas in a gaseous mixture at any particular moment, and for giving an alarm when the instrument is taken into the presence of any such mixture.

Pressure or Exhaust Gauges with Electric Signals.—Sheard, J. T., and Harrison, S., of Salford. No. 11,379; July 21, 1890. [8d.]

This invention relates to means for enabling the moving mechanism of pressure or exhaust gauges to make metallic contact between the terminals of an interrupted or open electrical circuit, so as to close the circuit, and thereby cause an electric bell to ring or other corresponding signal to be made. The invention has reference principally to gas gauges, in which the actuating pressure or exhaust is indicated by a pointer moving in front of a dial and carried upon and operated by the revolution of a horizontal shaft or spindle—as in a King's pressure-gauge and in the mercurial pressure-gauge described in patent No. 12,893 of 1887.

Fig. 1 is a side view of the apparatus. Figs. 2 and 3 are views (at right angles) of the two parts of the apparatus seen in opposite directions.

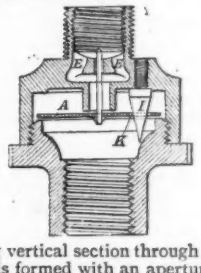


Fixed at one extremity of the horizontal shaft A carrying the pointer of the pressure or exhaust gauge (or of any other horizontal shaft revolving by, and correspondent with, the actuating pressure or exhaust on the gauge) is a balanced wheel B, having on its periphery a projecting metallic pin or stud, preferably of platinum; or the stud may be fixed directly on the shaft without the intervention of the wheel. Exactly opposite and in proximity to, and in a plane parallel with, the wheel B, or of the revolution of the pin or stud, is another wheel C (termed the loose wheel), of somewhat larger diameter, free to revolve, when actuated as hereafter described, in suitable bearings on a horizontal axis, but weighted at one point D so as always to bring the wheel, when released, to rest exactly in the same position. The rim of the loose wheel C is pierced with a number of holes E corresponding in number and position with the different degrees of pressure or exhaust recorded by the gauge, or with the points of pressure or exhaust at which an alarm or signal is required to be made. Into one or two of these holes (according to circumstances) a pin or stud of metal—preferably platinum—is so arranged as to come into contact with the projecting pin or stud on the periphery of the wheel B or horizontal shaft A; so that, by the operation of the pressure or exhaust on the gauge, the latter is revolved to the necessary extent. One terminal wire W^1 of an electric circuit (containing the necessary battery, bell, or other apparatus for producing the required alarm or signal) is fixed to a metallic support or framework F carrying the loose wheel C, but insulated from electrical contact with the framework G or other metallic parts of the gauge itself by the interposition of a block of hard wood H. The other terminal wire W^2 is so connected to some part of the body of the gauge that there may be electrical conduction to and from it and the projecting pin or stud on the periphery of the wheel B or horizontal shaft A.

The action of the apparatus is as follows: When the gauge is subjected to pressure or exhaust, the horizontal shaft A carrying the projecting pin or stud revolves until the latter comes into contact with one of the pins or studs on the loose wheel C. Electrical contact is thus made between the terminal wires W^1 W^2 of the electrical circuit, and a signal is made, which continues until the pressure or exhaust recedes from the point at which the pin on the loose wheel has been set to make contact. If the pressure or exhaust continues to increase, the contact of the studs causes the loose wheel to be carried round with the revolution of the horizontal shaft A; the electrical contact being maintained and the signal continuing to be made. When, however, the pressure or exhaust recedes, the weight D of the loose wheel causes the latter to return to the position at which it was started.

Regulators for Gas-Burners.—Clouet, G. P., of Neuilly, France. No. 11,739; July 26, 1890. [8d.]

This invention consists of an arrangement of double-action dry regulator for gas-burners, capable of acting at high pressure, and enabling a burner to burn at low pressure as though it were not furnished with a regulator, and with a normal height of flame. This result is arrived at by increasing in large proportions the diameter of the regulating apertures, which avoids first the fouling that takes place when the gas is impure; and when the pressure falls the gas still finds sufficient passage to supply the burner.



In the accompanying vertical section through the axis of a regulator, the regulating-plate A is formed with an aperture K, and carries at its centre a pin which guides the plate in its upward and downward motion. The plate is placed in a space or recess formed between the upper and lower parts of the casing, which are screwed together, and also screwed for attachment upon the gas conduit and to the burner. The pin passes into a hole formed for this purpose in the central part of the piece, which is furnished with conduits E, for the distribution of the gas. A cone I, fixed to this piece forms, in combination with the plate A, furnished with the aperture K, the essential part of the invention; the cone passing by its apex through the aperture and serving to regulate the size of the passage for the gas.

According to the pressure of the gas, the plate is more or less raised; and in proportion to its height, the passage K is diminished in area by the effect of the cone I, occupying more or less of the space of the aperture. Consequently, the greater the pressure, the smaller will be the outlet orifice for the gas; and in this manner the flame is always

maintained at about the same height. The normal regulation is effected in advance; and the flow increases or diminishes by screwing more or less the top part of the casing upon the bottom part—that is to say, by giving to the plate A a space larger or smaller in which to move.

Lighting and Extinguishing Gas-Lamps.—Huelsen, C.; communicated from A. Silbermann, of Berlin. No. 11,918; July 30, 1890. [6d.]

This invention relates to a device for lighting and extinguishing gas-lamps, more particularly intended for the lights in railway cars.

To the lower portion of the burner is secured a horizontal guiding for a side-block, connected with a percussion igniting contrivance. The guiding carries an elastic hook adapted to engage with a ratchet-wheel serving to operate the igniter. The latter has secured to it a downward arm, so shaped as to embrace at the bottom a lever connected to the gas-cock; the device itself being adapted to be moved in the guiding by chains, cords, or any other suitable means. When the percussion igniting device is shifted towards the burner, the rachet-wheel engages with the elastic hook, and is turned thereby for one division; thus causing ignition to take place—the gas-cock having been simultaneously opened through the arm and lever referred to. While the gas is alight, the igniting device is placed beyond the hook; but on being returned into its original position, its arm and lever cause the cock to be closed, and the flame put out; the ratchet-wheel (owing to the shape of its sprockets and of the elastic hook) sliding over the latter without being turned.

Generating Heating and Lighting Gases from Liquid and Solid Hydrocarbons.—Thwaite, B. H., of Liverpool. No. 971; Jan. 20, 1891. [1s. 1d.]

This invention relates partly to improvements in former inventions for which patents have been granted to the present patentee—No. 15,621 of 1886, No. 6432 of 1888, No. 10,224 of 1888, No. 16,970 of 1888, No. 13,574 of 1890, and No. 594 of 1888. Such improvements also "permit the production of a permanent or fixed character of luminous gas (from inferior grades of liquid hydrocarbons) of a high photometric value."

As in the inventions the numbers and dates of which are above indicated, the essential feature is the employment of two vessels or chambers connected together at their upper part by a refractory lined conduit; each vessel forming a necessary element in effecting the cycle of actions to be described. In the upper part of each vessel is an annular cavity, the inside hanging wall of which is supported by projecting corbels or oversailing courses; and it is also loosely filled with open or checker brickwork, in such a way as to provide a considerable heating surface and capacity for the accumulation of heat, without such brickwork or cavity interfering with the distribution of the fuel fed into the vessel. To the upper part of each vessel and connected to the annular cavity described, is an air-inlet arrangement for supplying air for the combustion of part of the gas produced by the cycle of operations; such combustion taking place immediately over the fuel in each of the vessels. The flame of combustion flows amongst the checker brickwork, and raises the temperature of it to a degree necessary for the volatilization and the fixing of the liquid hydrocarbon injected by or with steam into the centre of the chamber. When both vessels are charged with carbonaceous fuel, air injected by means of a steam jet is first directed to the under grate of one vessel, and then to the under grate of the other vessel at specific periods. The injector is fitted with an arrangement by which the air can be quickly and effectually turned off.

When both vessels are charged with fuel, each one is alternately subjected to the same conditions; serving at alternate periods for volatilization and fixing of the oil gas, and alternately for revivifying the fuel and restoring the temperature. The products of the combustion occurring in both chambers over the fuel, alternately descend through the fuel on one side, and then through that on the other, for a period depending upon the interval between the reversal of the valves. The gas is generated first in one vessel, and consumed partly therein, and completely consumed in the second, in and by which the fuel is raised to a high temperature. The products of combustion, in descending through the mass of fuel, are partly re-arranged; the carbon dioxide being converted into the carbon monoxide. The reversal of the directions of the cycle produces an identical arrangement of reactions and new chemical combinations. When the temperature of both chambers and the fuel in the vessels is sufficiently high, the air-valves are closed, and the air is injected by steam into first one vessel, and afterwards the other, according to the direction of the cycles of the operations. During the period of the application of the oil, the steam is introduced through the steam-jet air-blower into the same vessel as the oil. The steam, in passing through the incandescent fuel, is converted into water gas; and this gas mixes with the vapour of oil and water or steam in the passage through the conduit connecting the two vessels along with the vapours named, which, in the instance of the vapours of oil, in passing descensionally through the incandescent fuel, are converted into a permanent gas—the water vapour or superheated steam being converted into water gas.

When only one vessel is filled with carbonaceous material, the same initial action takes place in the introduction of the oil and steam, and in the passage of the water gas and vapour of oil and steam, through the incandescent refractory material. The only alteration is the rendering permanent of the gas; the steam being still steam when the gases leave the regenerator, except that portion which may be re-arranged in contact with the hydrocarbons as they descend through the refractory material. In the passage of the gases through the condensers, the steam remaining in the gases is condensed out. The duration of the time that the oil and steam is injected into the vessels depends upon the heat accumulation capacity of the generators; and it is turned off before the temperature of the fuel or the refractory material has fallen below the degree necessary for the efficient volatilization and fixing of the gases produced.

In order to generate the gas in sufficient volume to enable an adequate degree of combustion to proceed that will generate heat to effect the volatilization of the oil and render the gas permanent when generated, as well as to enable a *pari passu* production of water gas to be generated along with the generation of the oil gas, the air may be forced under the fire-bar grates for the purpose of generating the gas, either by a steam-jet inducer or by mechanical means; but the patentee prefers the arrangement of steam-jet air-flow inducer, by means of which the flow of air can be either regulated, or closed off entirely. By allowing the steam *per se* to enter the fuel, water gas is produced, and the fire-bars are kept cool.

The following is a brief recapitulation of the essential features of the invention: 1. The employment of two gas-generating vessels, connected together by a conduit, and acting in unison. 2. The formation of combustion chambers and heat accumulating space over the upper level of the fuel or refractory material, as the case may be, for the purpose of effecting the combustion of the whole or part of the gaseous fuel therein, by which the temperature of such chambers, and the refractory material contained therein, is raised to a sufficiently high temperature to effect the volatilization and fixing of the gas produced from the solid or liquid hydrocarbon. 3. The position and form of the annular hydraulic main and outlet blocks. 4. The employment of the following elements in their respective positions: The air-inlet valves, with their ignition arrangements, by which air is admitted into the combustion chamber over the level of the fuel or the refractory material, as the case may be, in both vessels, and by which the ingress of such air can be effected without the production of explosive mixtures of air and gas, and by which the gas can be ignited immediately the air is allowed to flow into both combustion chambers. The central air ingress valve, with its safety-valve and ignition system. 5. The employment of a steam-jet air-injector in such a way that the air supply can be immediately shut off; and the steam supply *per se* can be allowed to enter the fuel for the production of water gas.

The invention possesses (according to the patentee) the following *primâ facie* advantages over other existing systems: 1. It will enable the commoner oils or liquid hydrocarbons to be converted into permanent gas of high photometric efficiency in proportion to its intrinsic monetary value. 2. It will permit the volatile hydrocarbons evolved from the coal used to be converted into permanent and fixed gas. 3. It will allow the production of water gas along with a fixed and permanent oil gas with which it is thoroughly and uniformly diffused. 4. It will include the injection of oil by means of steam, and the partial decomposition of the latter either by contact with the solid or liquid hydrocarbons. 5. It will enable the simultaneous production of water gas and generator gas; and by a simple arrangement of reversal valves, actuated by the movement of one lever or automatically, the direction and character of the processes can be immediately reversed.

APPLICATIONS FOR LETTERS PATENT.

9997.—Armstrong, J., "Improvements in pipes or tubes for conveying liquids and gases, for protecting and insulating electric conductors, and for other like purposes." June 12.

10,033.—Greene, T. A., and Walker, C. M., "Improvements in gas-governors." June 12.

10,111.—Crowe, E., "Improvements in gas-burners for heating and cooking." June 15.

10,249.—Chesterton, W. J., "A new or improved kerb or gas-heating stove." June 16.

10,269.—Taylor, G. H., and Lowe, W. O. A., "Improvements in self-containing gas-fired steam generators." June 16.

10,333.—Fiddes, A. and F. A., "Improvements in gas motor engines." June 18.

10,371.—Branston, F. R. E., "Improvements in the production of light and the generation of heat and electricity." June 18.

10,427.—Wainwright, R., "Improvements in or relating to means or apparatus for treating gases, smoke, and other products of combustion, so as to render them innocuous." June 19.

10,435.—Hamilton, J. H., and Rollason, A., "Improved governing mechanism of gas motor engines." June 19.

10,487.—Clarke, J., Haynes, W., and Robinson, F., "Improvements in contrivances for gas-controlling purposes." June 20.

10,545.—Reynolds, T., "Improvements in clay and asbestos fire-balls for use in gas-fires." June 20.

The Powers of the Barnstaple Water Company.—About two months ago the Barnstaple Town Council appointed a Committee to inquire into the powers possessed by the Water Company. The Committee prepared a case, setting forth various points with regard to which questions had been raised, and submitted it to the Attorney-General (Sir R. E. Webster, Q.C.) and the Recorder for the borough (Sir G. S. Baker, Bart.). The opinion of Counsel was read by the Town Clerk (Mr. J. Bossom) at the monthly meeting of the Town Council yesterday week. It was to the following effect: "1. The Water Company had no power to charge a higher rate for water supplied from the new reservoir at Pickard's Down than for that which is supplied from the old reservoir at Raleigh—that is, that there can be no extra charge made for water supplied to the higher level districts from Pickard's Down. 2. That the Company at present can exercise no control over the constructions of taps, pipes, cisterns, and services for the supply of water for domestic purposes; the Company can exercise some control only after they have made regulations with the approval of the Local Government Board. 3. That, in supplying water for trade purposes, the Company should adopt and adhere to a uniform scale of charges. 4. That the Company are bound to supply every dwelling-house with water for domestic purposes, notwithstanding that a trade or business may be carried on in connection with such dwelling-house." The Town Clerk, in answer to a question, said that, according to this opinion, the Company could not refuse to supply one person with water for trade purposes if they supplied others—subject only to the condition that the supply would not interfere with the ordinary domestic service. There must be a uniform rate—all must be treated alike. The Company were quite within their powers, however, in charging according to the quantity of water used.

CORRESPONDENCE.

[We are not responsible for opinions expressed by correspondents.]

Mr. Edwards's Gas Institute Paper.

SIR,—In reply to Mr. Edwards's letter in your last issue, I would explain that the reason for the Council of The Incorporated Gas Institute wishing Mr. Edwards to modify his paper in certain respects was the fact that, in their opinion, it contained remarks which, if published, might have led the Institute into legal difficulties.

The Council regretted very much to feel obliged to come to this decision, and were sorry Mr. Edwards felt himself unable to fall in with their suggestions as to modification.

W. H. HARVEY,
Secretary, Incorporated Gas Institute.

3, *Victoria Street, S.W., June* 24, 1891.

The Enrichment of Coal Gas by Liquid Hydrocarbons.

SIR,—In the discussion on the papers read by Professor Vivian B. Lewes, and by Mr. William Foster, M.A., on the enrichment of coal gas by carburetting materials other than cannel, &c., at the annual meeting of the Incorporated Gas Institute, published in your issue of the 23rd inst. (p. 1237), Mr. W. A. Valon, of Ramsgate, referring to the method of carburetting gas by charging it with the vapour of volatile hydrocarbons, is reported to have said: "He (Mr. Valon) must say that, so far as his own experiments went, all such methods were more or less failures; and one fact alone was almost enough to prove this beyond dispute—viz., that those who carburetted gas in that way were always afraid to mix the hydrocarbon with the gas before it was put into the holder, but introduced it as it left the holder and went out into the district," &c. As I was not privileged to be present to contradict this assertion, I take the opportunity of doing so through the medium of the JOURNAL.

At the present time we have two of the enrichers fixed for the South Metropolitan Gas Company, London, enriching the gas on the inlet of the meter, before the gas goes into the holders. These have been at work for months past—no cannel coal being used on the works; and the quality of the gas delivered to the consumers has been better, and the cost of manufacture very much lower, than was the case previous to the introduction of our enrichers. Some are also fixed on the outlet to the consumers. At The Gaslight and Coke Company's works, one of the enrichers is fixed on both the inlet to the gasholders and the outlet to the consumers. This apparatus is capable of enriching 1,500,000 cubic feet of coal gas per hour to the extent of 1 sperm candle; or half the quantity, 2 candles, &c. This apparatus is also frequently worked both on the make and also on the outlet; and no cannel coal is being used at these works.

Mr. Frank Livesey, in his paper read before the last meeting of the Southern District Association of Gas Engineers and Managers [see JOURNAL for Nov. 18, 1890], stated that he had stored gas enriched to the extent of 2 sperm candles in a gasholder for five days, and found at the end of that time that it had not been depreciated. The gas has been tested at a distance of eight miles from the works, and has been found to be of the same quality as when sent out.

FRANK W. CLARK, Engineer,
The Gas Lighting Improvement Company, Limited.

Suffolk House, Laurence Pountney Hill, E.C., June 27, 1891.

SIR,—Without involving the acceptation of any of the conclusions and opinions recently appearing on the subject of liquid hydrocarbon enrichment of gas, but merely as an interesting figure of comparison, it may be stated that, on the basis of the figures given by Mr. Goulden, in his paper read before the Incorporated Institution of Gas Engineers (*ante*, p. 950), calculation shows that, using Novorossisk oil, available in the Southall generator plant (Thwaite's patent), the cost of enriching 16-candle gas up to 17½-candle power will be 0·865d. Therefore it is cheaper than any of the systems given in Professor Lewes's table of the comparative cost of various enrichers, which appears in his Gas Institute paper (*ante*, p. 1182). Surely, however, Professor Lewes must be in error in placing the cannel enrichment at the head of the list, and as the most expensive. My own considerable practical experience tends to show that, in the South at least, the economic efficiency between enrichment with liquid and with solid hydrocarbons will be in favour of the former; but there is no such disparity as is shown by Professor Lewes. Exaggerated statements of economy, especially those of a professional origin, are to be deprecated, as they only tend to disappoint users who would otherwise have been satisfied with reasonable success and economy. The Novorossisk oil used in the Southall plant is quite safe to store, and the plant is also practically automatic, and controllable by unskilled men. It is therefore a useful auxiliary to existing retort plants; and, although it has been working under disadvantageous conditions, it has given interesting results, which may form the subject of an exhaustive memoir.

Liverpool, June 22, 1891. B. H. THWAITE.

Mr. Walmisley's Gas Institute Paper.

SIR,—In your report of Mr. Walmisley's reply to the discussion of his paper, and having reference to my remarks on the action of sudden gusts of wind on a gasholder, I find him made responsible for the following words: "At the same time, although there were no outside standards, if the holder consisted of more than one lift, there was a continual blow brought by the action of the wind on the cup-and-grip connection on the windward side."

This statement, as apparently coming with authority from an expert engineer, is one which cannot for a moment be defended; and I do not think Mr. Walmisley will attempt the task. If I mistake not, he made it under an entire misapprehension; and besides, every gas engineer well knows that the dead weight of the lower lifts has to be carried by the inner lift—a fact which renders any up-and-down hammering action at the grip, on either side, an utter impossibility. As there are always some, however, who take a statement for granted, without stopping to examine it critically themselves, it is necessary to draw attention to words which, if Mr. Walmisley had had more experimental acquaintance with gasholders, would probably never have been said.

There is just another little point. Many persons present at the reading of the paper (myself included) imagined, from the pointed reference to my invention by name, that allusion thereto was intended when dealing with the absence of columns. Yet, to my surprise, I heard Mr. Walmisley say at the meeting, and now find from your report, that "he did not allude to Mr. Gadd's spiral guides." It might have been preferable if this fact had been rendered clearer in the original paper.

Manchester, June 24, 1891. W. GADD.

Revolving Furnaces for Lime-Burning.

SIR,—Lime burning in revolvers is not new; neither is the use of two cylinderf working in conjunction. I saw in the patent register some two or three years back, two cylinders working together in unison and continuously—Thwaite's system, I believe. Mr. Stokes, therefore, has no novelty he can support. It would be interesting to know what experience he has actually had in lime-burning in cylinders. If he cannot do better than 3 cwt. of coke, which I suppose is merely an assumed figure, he will not compete with existing arrangements; as in North Wales lime has been burnt with 4½ cwt. of slack coal, costing about half the price of coke. Of course, anyone knows that lime-burning is economically and scientifically done in the present kilns, and the chemical equations show this.

June 26, 1891. CALCIC.

Extension of the Halifax Water-Works.—The Halifax Town Council at a recent meeting confirmed a resolution as to the purchase of land (about 153 acres) required for water-works purposes at Walshaw Dean. With regard to this extension, parliamentary powers for the construction of their great scheme of water-works were obtained by the Corporation in 1868. These were renewed in 1876 as far as the yet unconstructed works at Walshaw were concerned, and again in 1888. The present extension, which when carried out will complete the scheme, will consist of three reservoirs—viz., the Upper, the Middle, and the Lower reservoirs. Their total capacity will be 623,920,470 gallons. The drainage area from which water will flow into the reservoirs is 2300 acres; and the available rainfall is taken at 27 inches per annum. The yield per day for the town, after paying compensation, is computed at 2½ million gallons; and the estimated expenditure is £160,000.

A Year's Operations at the Burnley Corporation Gas-Works.—In his annual report, Mr. J. Petty Leather, Manager of the Burnley Corporation Gas-Works, states that the increase in the make of gas in the year 1890-91 was 44,617,000 cubic feet, or 12·66 per cent. on that of the previous twelve months. The largest consumption in one day was 2,591,000 cubic feet, as against 2,322,000 cubic feet. During the year, 72 additional lamps were erected; bringing up to 1664 the total in use. These consumed, in the 3684½ hours they were lighted, 34,164,000 cubic feet of gas. There were 37,967 tons of coal, and 2626 tons of cannel used during the twelve months. The new meters fixed exceeded the number taken out by 1920; and the amount received for gas and meter rents was £42,100. The business done in gas-stoves showed a most satisfactory development. There were 21 cooking-stoves and 56 gas-fires sold for cash; 167 cooking-stoves and 26 gas-fires were fixed on the deferred payment system; and there was an increase of 36 in the number of stoves and fires let out on hire.

The Gas Undertaking of the Coleraine Commissioners.—At the recent annual meeting of the Coleraine Town Commissioners, the retiring Chairman (Mr. R. A. Taylor) delivered an address, in the course of which he referred to the progress of the gas undertaking, which is under the management of Mr. W. S. Stormonth. He stated that the balance to the credit of the gas-works was returned at £98 at the end of the last financial year, against £167 in the previous twelve months; but there was in stock about £300 worth of coal more than at the end of that year. Besides, they had to include in the past year's expenditure the cost of a cargo of coal which came in the former year; and this would mean another £100. Then they had the pleasure of paying off a mortgage for £400, which reduced the debt on the gas-works to £1200. The sale of residuals had been good. Since the manufacture of sulphate of ammonia was commenced, the receipts from its sale had amounted to £588; and the outlay for acid had been £158—leaving a large margin for working expenses. In his opinion, the works were in splendid order. Mr. Taylor was unanimously re-elected to his position of Chairman.

Horsforth and the Electric Light.—At the meeting of the Horsforth Local Board on Monday last week, a communication from a Newcastle firm respecting the use of the electric light for public purposes was read. The Board had invited an estimate of the probable cost of lighting the township. The reply stated that, after careful consideration, it would require 60 arc lamps of 2000-candle power; and these, together with engine, boiler, dynamo, posts, and thirteen miles of wires, would cost about £2950. The cost of working such an installation, if in the firm's own hands, exclusive of interest on capital, and depreciation, &c., would be about £500 per annum; and each lamp would burn (say) 1800 hours. They further compared the price of the gas now used with the cost of electricity; and guaranteed sufficient light at a cheaper cost to the township. The Chairman (Mr. Newstead) said he found that, if they took the firm's estimate, the Board would have to pay £1560 a year, in addition to the working expenses, and the contractors would get 40 per cent. per annum on the outlay as well as the interest. It would pay them better to work an installation themselves, even if the Board had to borrow money. Some members thought that electricity at present could not be supplied cheaper than gas; and the papers were "ordered to be laid on the table."

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following progress was made with Bills last week:—

Bills read a second time and committed: Electric Lighting Provisional Orders Bills (Nos. 8 and 12).

Bills referred to a Select Committee, consisting of Lord Basing (Chairman), the Marquis of Bristol, Lord Braye, Lord Truro, and Lord Wimborne, to meet on Wednesday, July 1: Bognor Water Bill; Electric Lighting Provisional Orders Bill (No. 10).

Bills reported: Electric Lighting Provisional Orders Bills (Nos. 8 and 12); Local Government Provisional Orders (Gas) Bill.

Bills read the third time and passed: Electric Lighting Provisional Orders Bills (Nos. 5, 6, 7, 9, and 11); Gas and Water Provisional Orders Confirmation Bill; Local Government Provisional Orders (Gas) Bill; Rhyl Gas Bill; Stourbridge Gas Bill.

HOUSE OF COMMONS.

The following progress was made with Bills last week:—

Bills read the first time: Gas and Water Provisional Orders Confirmation Bill; Local Government Provisional Orders Bill (No. 13), to confirm certain Provisional Orders relating, among other places, to the Conway and Colwyn Bay Joint Water Supply District, Leicester, Salford, and Stafford.

Bills read a second time: Gas Provisional Orders Confirmation Bill; Water Provisional Orders Confirmation Bill.

Bills committed to a Select Committee, consisting of Mr. T. Fry (Chairman), Mr. Cust, Mr. Jarvis, and Mr. Leon, to meet on Thursday, July 2; Alloa Water Bill; Northallerton Water Bill.

Bills reported: Bristol Gas Bill; Croydon Water Bill [parties do not proceed]; Glasgow Corporation (Partick, Hillhead, and Maryhill) Gas Bill; Keighley Corporation Bill; London Water Commission Bill [preamble not proved]; Metropolis Water Supply Bill [preamble not proved].

Bills read the third time and passed: Dundee Water Bill; Glasgow Corporation (Partick, Hillhead, and Maryhill) Gas Bill; Kettering Gas Bill.

HOUSE OF LORDS COMMITTEE.

Thursday, June 19.

(*Before the Duke of* WESTMINSTER, *Chairman; the Earl of* YARBOROUGH, *the Earl of* CARYSFORT, *Earl* CAIRNS, *and Lord* HAMILTON OF DALZELL.)

SOUTHWARK AND VAUXHALL WATER BILL.

This Bill, which was to authorize the Southwark and Vauxhall Water Company to raise further capital to the extent of £300,000, to enable them to carry out additional works, came before their Lordships to-day. It will be remembered that the Bill was considered a few weeks ago (see *ante*, pp. 1022, 1071) by the Select Committee of the House of Commons who are dealing with the other Bills relating to the water supply of the Metropolis, when it was passed with certain modifications as to the allocation of the capital proposed to be raised. It was now petitioned against by the London County Council and the Corporation.

Mr. BIDDER, Q.C., Mr. CLAUDE BAGGALLAY, and Mr. ALLCROFT appeared for the promoters; Mr. FLETCHER MOULTON, Q.C., and Mr. FREEMAN represented the London County Council; and Mr. RIGG and the CITY REMEMBRANCER (Mr. G. P. Goldney) watched the proceedings on behalf of the Corporation of London, who merely petitioned against the Bill being altered from the shape in which it passed the House of Commons.

Mr. BIDDER stated the objects of the Bill, by which, he said, it was sought to raise £300,000 by the creation and issue of debenture stock, to be offered by public tender—the money so raised being applied as follows: £30,000 for providing additional filtration; £85,000 for the purpose of reservoirs at Nunhead; £40,000 for the purpose of providing additional engine power; £30,000 for the completion of works at Streatham; £20,000 for the completion of high-pressure service; £40,000 for the extension of mains and services; and the balance to any of the foregoing purposes, or to the general purposes of the undertaking to which capital is properly applicable. The promoters had no objection whatever to insert a clause in the Bill to provide for the approval of the Local Government Board being given before any capital was expended; and when approval had been given, the Company would be bound to filter their water unless the Board at any time certified that filtration was unnecessary. The London County Council (who were conspicuous by their own omnipotence in the Committee rooms) had, he said, thought fit to present a petition against the Bill; but he would first of all ask their Lordships to consider whether they had any *locus standi* on the question. After stating in their petition that they had power under the Metropolis Fire Brigade Act to require the Company to provide a supply of water in case of fire, and that under powers conferred upon them by Parliament they had the control of the system of main-drainage for the Metropolis, the Council referred to the fact that a Committee of the House of Commons had under their consideration the question of the ultimate treatment or disposal of the undertakings of the various London Water Companies, including that of the Southwark and Vauxhall Water Company. But, said Mr. Bidder, it did not follow that the Committee would necessarily resolve to authorize the disposal of the undertaking, although very likely they might do so; and even if they did, what had that to do with the question of the Company getting the capital they required for adequately dealing with the present supply of water in their district, and the wants of the population as they grew. Then, again, the Bill did not interfere with the powers conferred upon the Council, under the Act of 1890, to prosecute inquiries relative to the water supply of London; nor did the fact that they were already engaged in investigating whether the existing sources of supply from the River Thames were adequate for present and future requirements come within a hundred miles of the Bill. The reason why the *locus standi* of the London County Council was not objected to in the House of Commons, he might say, was because in the Lower House there happened to be a Standing Order of such a sweeping character and in such general terms, that, however irrelevant the subject, the *locus standi* of a municipal authority could not be objected to on a question of water supply. But fortunately there was no such Standing Order in the House of Lords, where it was the custom in every instance to consider whether, upon the merits of the particular case, there was anything in the proposal affecting the interests of petitioners or interests which were in their charge. Then they wanted to come and discuss the question whether the filter-beds which the Local Government Board said were necessary should not be provided out of the revenue. They might just as well suggest that, when a very great railway had developed its traffic, until it became necessary to duplicate its lines, that should not be paid for out of capital; or that when a station had to be doubled in size, that should be done out of revenue. The other local authority—the Corporation of the City—were satisfied, and said it was a proper and reasonable Bill; but the County Council, with all the zeal of youth, and the desire to show themselves useful in every sphere, wanted to have *locus standi* for the purpose of discussing the question. They suggested this, not on the ground that they had powers to buy the undertaking of the Southwark and Vauxhall Company, because they had no such power; not because they were the water authority, which they were not; but because perhaps next year, or five or ten years hence, they might become the water authority. They also objected to the provision that the balance of the moneys to be raised under the powers of the Act, should be applied to general purposes, as was proposed; and that not having been able to obtain plans of the works, they were unable to say how far, if at all, they were essential. He would respectfully say that this was not one of the purposes for which the London County Council had been formed under the Act of 1888. It was not their business to criticize the plan proposed, or to investigate the propriety of the expenditure. Taking all the circumstances into consideration, he asked their Lordships to consider—remembering that it was merely a Bill to raise the capital necessary for the undertaking, remembering that the County Council was not in any sense the water authority for London, and remembering, too, that in connection with the matter of finance the City who were mentioned in the Bill of 1886, and who had a certain position connected with the Company, were satisfied—whether they could find any interest represented by the London County Council, or anything within the sphere of their duties touched upon by the Bill, and whether their Lordships were going to give their *locus standi* to discuss purely academical questions, upon which he submitted they had no right to be heard.

Mr. FREEMAN confessed that the position taken by Mr. Bidder came upon him rather as a surprise, because, when the Bill was before the other House, no suggestion of any sort or kind was made on behalf of the Company that they objected to the County Council discussing the questions (which they then did, with the result that the Bill as introduced was very considerably modified), or that there was anything unreasonable in the position taken by the Council. If they were entitled to be heard in the House of Commons, he thought he should be able to satisfy their Lordships that they were still more entitled to be heard now. He would point out in the first place that the County Council only came into existence in 1888, prior to which date the management of the Metropolis was to a certain extent carried on by the Metropolitan Board of Works, who were in this peculiar position—that (excepting as regards certain Acts relating to fire and constant pressure) they had no direct interest in the water question; and it was extremely doubtful whether they had any right even to promote Bills relating to water questions. Nevertheless, so strongly did they feel on the subject, that from 1881 to 1886 (which was the date of the last application for capital powers by one of the London Water Companies), the Metropolitan Board appeared nearly every year before Committees of Parliament to deal with the very question of the increase of the capital powers of the Companies—having regard to the purchase which must sooner or later take place of those Companies. The result of this proceeding was that in nearly every case the increased capital powers sought by the Companies were, at the instance of the Metropolitan Board and of the Corporation of London, either struck out bodily or very largely cut down. Such being the position of things under the Metropolitan Board of Works, the County Council, when they came into existence, had precisely the same interest as the Metropolitan Board had in looking after the water question; and although it was perfectly true that no decision had been finally come to by the Committee of the other House, of which Sir Matthew White Ridley was Chairman, it had been most distinctly stated that they did lean to a combination of the London County Council and of the Corporation being the water authority to regulate the whole of the water supply of London. Therefore it was simply astounding to hear Mr. Bidder say that the County Council had no interest in the question of the increase of the capital of the Southwark and Vauxhall Company amongst the other Companies, because the County Council would be the persons who would have to purchase those Companies, and who would have to pay off all the additional capital brought in. It had been stated that the Bill was simply a Money Bill; but, as a matter of fact, it was a Bill to authorize and carry out very extensive works indeed—works of filtration, further reservoirs, works extending the district of the Company, and all kinds of works which must very considerably indeed increase the capital value of the Company. In regard to all this, the County Council, as the persons who would in future have to pay for these works and to buy up the Company, certainly claimed to be heard.

The CHAIRMAN: You said "increase their district," Mr. Freeman. I do not think they increase the district.

Mr. FREEMAN: They do not increase the district; but what they do is this: They say, "We require a certain amount of capital to meet

he new houses built in our district, and which will require a supply of water." In the same way as regards many of the reservoir works, the Council claimed to be entitled to ask questions of persons responsible for the Bill, because they were not satisfied to accept all its provisions upon the *ipsi dixit* of Sir Henry Knight—however eminent a manager of water-works he might be. The position taken up by the Council was shortly this: That there being a Bill which contained numerous powers to increase the value of the Company's undertaking, and it having been clearly laid down that at no distant date the Council must be the persons to buy up all that was asked for under the Bill, they should be the persons to criticize first of all the works, and secondly the manner in which they were to be paid for. As regarded the working-out of the principle, the Council ventured to submit that it was open to criticism, and that they could point out "a more excellent way" of doing the same thing.

The CHAIRMAN: May I ask how that is compatible with the statement in your petition, "Your petitioners have not been able to obtain plans of the proposed works, and are unable therefore to consider how far (if at all) they may be essential, or to examine into the propriety of the proposed expenditure?" You do not know what the plans are.

Mr. FREEMAN: That is one of the reasons why we consider we have power to complain of this Bill. There are no plans deposited which would enable us to judge what the details of the proposals are; and the sole way to arrive at the facts is by asking certain questions of the Engineer, who is responsible for the works, and of the Chairman of the Company, who is responsible for the policy which dictates these works. On the pure question of *locus standi*, without touching merits at all, he (Mr. Freeman) submitted that he had shown a sufficient *prima facie* case to justify his being heard to criticize the Bill and to point out certain ways in which—while in no way interfering with the requirements of the Company—the money could be provided without injury to the public.

Mr. BIDDER briefly replied.

The Committee then deliberated for a short time in private. On the re-admission of the public,

The CHAIRMAN said: The Committee are of opinion that the London County Council have no *locus standi* on this Bill.

Mr. RIGG then stated that, after such an intimation from his Grace, he would not have to trouble the Committee further.

Mr. BAGGALLAY, for the promoters: There is one clause to be added in compliance with the Local Government Board report; but that, of course, we shall bring up before the Unopposed Bill Committee, and get it inserted.

THE METROPOLITAN WATER SUPPLY INQUIRY.

Fifteenth Day—Wednesday, June 10.

Before Sir MATTHEW WHITE RIDLEY, *Chairman; Mr.* T. H. BOLTON, *Sir* ALGERNON BORTHWICK, *Mr.* BRISTOWE, *Mr.* H. W. LAWSON, *Mr.* J. W. LOWTHER, *Mr.* MURDOCH, *and Mr.* ROWNTREE.)

METROPOLIS WATER SUPPLY BILL

When the Committee met this morning, they spent some time in consultation, at the close of which

The CHAIRMAN said: In view of the period of the session at which we have arrived, the Committee wish to intimate to the parties that they do not desire any more evidence from the opponents against the Trust proposed by the Bill before the Committee; that they do not, under the circumstances, consider themselves in a position to examine into, or report upon, the quantity or quality of the present supply, or the means by which any additional supply may best be obtained. They have indicated already that they think no more water should be drawn from the Thames than is at present authorized. I think this intimation will be sufficiently understood by the parties.

Mr. PEMBER said, with regard to the last point, he assumed that the declaration of the opinion of the Committee would be limited to this—that no more water should be taken from the Thames, as things now stood, but that this would not preclude the possibility hereafter, if proper storeage reservoirs could be provided, of taking water from the Thames Valley.

The CHAIRMAN said he should consider that as being quite another question. The object of the Committee was really this: They felt that, at the advanced period of the session which they had reached, with the Bills before them and having other facts in view, it would be impossible for them to conduct what would be a satisfactory and exhaustive inquiry which would enable them to express an opinion as to whether or not the present supply was sufficient. Therefore they thought it would be very undesirable to commence any scientific or engineering evidence which would go into any questions as to the present sources of supply or the future supply.

Mr. PEMBER remarked that, as the Water Companies were not bringing any evidence against the Trust proposed by the Bill, they desired to know if the Committee intended to take up the subject of purchase. He asked the question, bearing in mind what the Committee stated at the beginning of the inquiry, as to not going behind the declaration of 1880.

The CHAIRMAN said he thought that the Committee would desire to have some further evidence which would enable them to form an opinion as to what they should recommend with reference to compulsory or non-compulsory purchase of the Water Companies' undertakings.

Mr. LITTLER, on behalf of the Corporation of London, said he had considered the matter very carefully with his clients; and they were of opinion that, within the Standing Orders, they might assist the Committee by bringing this important question further forward than it was at present. They would be prepared at any time, when the Committee thought it was a convenient stage, to suggest amendments which they believed would be of great value to the Committee. He should be prepared to do this by the next morning, so that the labours of the Committee might not be thrown away and the session wasted.

Mr. MOULTON, on behalf of the County Council, said they had considered the matter in connection with the Biill promoted by the City Corporation; and they were also of opinion that it might be altered in such a way as to avoid the objections which the Committee entertained to it in its original shape, and be put into such a form as would enable the Committee to empower a suitable body to take the necessary steps for legislation at as early a date as possible. Of course, they would suggest that it should be altered along the lines of the arrangement come to between the City and the County Council, and make the Council or its Statutory Committee one of the parties to be empowered in the future to take the water supply into their hands, and promote Bills necessary for dealing with such an exceedingly difficult problem. If the Committee would allow the London Water Commission Bill (which, according to the forms of the House, was still before them) to be amended, and to come before them as a substantive proposition, he should be able to regard this as the proposal before the Committee, and shorten his evidence.

Mr. PEMBER, speaking on behalf of the London Water Companies, called the attention of the Committee to the fact before them, that they had been brought, at very great expense, to consider certain Bills which were referred to them in connection with instructions given by the House. With regard to one Bill—the London Water Commission Bill—the Committee, on the 28th of April last, said they could not see their way to passing its preamble. He had never known a Bill to be revived which had been thus rejected.

Mr. LITTLER said the Bill had not been rejected; it was on the Votes each day.

The CHAIRMAN said the Committee did not intend, by their decision, absolutely to kill the Bill. They had in view something like what had now occurred, and the possibility of seeing their way to helping forward this important question by an amendment to some Bill.

Mr. PEMBER said, this being the case, he had not a word more to say on the subject, as the Water Companies had no desire to thwart the Committee in taking whatever steps they deemed desirable.

The CHAIRMAN said he did not know whether the course he had proposed would be the most convenient one, or whether the Bill then before the Committee did not present a means of carrying out the same object. The Committee would not put in anything affecting the interests of the Water Companies before they had heard what the Companies had to say upon the matter.

Mr. BALFOUR BROWNE asked if the Committee had decided that no more than 130 million gallons of water were to be taken from the Thames.

The CHAIRMAN replied that the Committee did not mention 130 million gallons, because they did not know whether or not this was the authorized quantity; but, so far as they had seen, they were clearly of opinion they were stating what was merely a truism—that the present abstraction of water from the Thames should not be exceeded.

Mr. BALFOUR BROWNE remarked that the Committee did not say anything about the Lea. For Hertfordshire he was interested in the Lea; and he wished to know whether the Committee had decided that no more water could be taken from that river.

The CHAIRMAN said he understood there was no parliamentary limit as to the Lea; therefore the Committee did not speak about it.

Mr. BALFOUR BROWNE said there was no statutory limit as to the quantity of water to be drawn; but Hertfordshire was before the Committee to ask them to fix one. They might say that no more water than was at present being drawn from the Lea should in future be taken.

Mr. PEMBER said if the Committee meant to say that under no circumstance, would Parliament sanction the further taking of water from the Thames, even without making storeage reservoirs, he might be allowed to remark that they had heard no evidence upon the subject. He was able to tell them at once, with regard to this point, that the Water Companies would be prepared with the strongest possible evidence; but at present, although the Committee might hold an opinion, it was one which they had not allowed themselves to test by any inquiry. They had not had any opportunity of calling evidence; and he might be permitted to say that a declaration of this kind, made as the final opinion of a Committee specially constituted, as this was, and embodied in their report, would have an effect upon the future of the Water Companies and the course of legislation which would be, to say the least of it, extremely awkward. In the future, persons who saw the decision would not be informed that the declaration was made without hearing any evidence whatever from the Companies as to the conditions under which the amount of water in question was taken, the effect upon the river, and various other circumstances. Therefore the Committee really were prejudging, without inquiry, the question of where the future supply of London should come from.

The CHAIRMAN said the opinion of the Committee could not possibly be held to exclude a scheme by which storeage reservoirs or otherwise might be used in connection with the River Thames.

Mr. PEMBER went on to remark that inside this question came a somewhat narrower one, as to whether, after all, the ultimate capability of the Thames as a source of supply was exhausted. He was bound to say very frankly that there were two sides to that question.

Mr. POPE said that if the Committee could regard the declaration in the sense in which they had just intimated—that they would not sanction or authorize the taking of additional water from the Thames without prejudicing the question on either side—if the Committee would regard it as a purely neutral expression, leaving it open to further evidence, of course they could deal with the matter without affecting the case one way or the other.

Mr. BIDDER said, on behalf of the Company he represented (the Southwark and Vauxhall), they would very strongly deprecate any expression of opinion of the Committee on this subject which might prejudice future proceedings, unless the matter had been gone into and they had been heard upon it. It might place them at a great disadvantage, and the opinion of the Committee might be quoted hereafter in a way that perhaps the Committee did not intend.

Mr. PEMBER asked if the Committee would forgive him if he boldly asked them to reconsider the question whether these particular words on the topic under discussion were worth their announcement at that moment.

The CHAIRMAN (after consulting with other members of the Committee) said the Committee had some little difference of opinion on the subject. They did not want to prejudice the question, and would there-

fore withdraw the words altogether, as they had not received exhaustive evidence to enable them to give an authoritative opinion.

Mr. RICKARDS, on behalf of the promoters, reminded the Committee that, in his opening remarks, he clearly stated that the exact constitution of the Water Trust by direct representation was not a vital part of the Bill; and they would be put to very great expense in remaining in the inquiry unless they were permitted to make some suggestion of their own as an alternative to the Trust. As the Committee had been good enough to indicate their approval, to a certain extent, of the principles of the Bill generally, if they were to be kept there, and continue to bear the burden of the expense of the Bill so far as its promotion was concerned, he thought they should be allowed hereafter, when the proper time came, to make their own suggestions, having in view the decision of the Committee.

The CHAIRMAN said, with reference to the suggestion of an alternative proposal, the Committee desired to ask this question: Supposing the Committee come to the conclusion, to which their minds were rather leaning at present, that they would be inclined to accept the proposals of the County Council and the City together with reference to the authority to be constituted, would this be a kind of alternative proposal which the Vestries would be competent to insert in the Bill, or to accept?

Mr. RICKARDS said that, with respect to the first question, it would certainly be competent for them to do so. All that their notices referred to was that a Water Authority should be constituted—either a Water Trust or the County Council. If the Committee should be in favour of the Statutory Committee of the County Council and the Corporation combined, he thought there was no doubt that this would be within the notices with regard to the other question. As to whether it would be acceptable to the promoters, he would like a little time to consider the matter. Regarding the supply from the Thames and the Lea, under the Bill this was left in the same state as at present; and there was no necessity to give any indication or decision upon the subject as far as the Bill was concerned.

Mr. LITTLER remarked that a great part of the Vestries' Bill was gone already, because the promoters had abandoned the County Council alternative; and another part of the preamble was one which certainly was undesirable, because it stated that it was expedient that the duty of providing the water supply should be vested in a public authority, with power to acquire, by agreement or otherwise, the undertakings of the Water Companies, whereas the preamble of the Corporation's Bill was one that could be worked upon. They, as representing the City, had no possible interest in this matter except to carry out the decision of the Committee. The City had the funds with which to provide the material for the consideration of the Committee; and it would be no burden upon anybody, ratepayers or anyone else. Consequently, there was no necessity for the Vestries to remain in the inquiry. Without making the suggestion that those who paid the piper should choose the tune, surely the County Council and the City, towards whom the Committee were at present inclined, should have the conduct of the Bill. To entrust the Vestries with the power and duty of suggesting what powers and duties should be imposed on somebody else, was quite unreasonable.

Mr. RICKARDS said the Committee had already decided against the Bill of the Corporation, on the ground that it did not provide any machinery whatever for carrying out the objects of a public Water Authority. With regard to the preamble, the first part of the Vestries' Bill would stand if they substituted the Statutory Committee for the County Council as a whole, or for the Water Trust. The Statutory Committee would be a public Trust; and he saw nothing in the preamble that would not stand if they accepted the Committee instead of the Trust. He had conferred with Mr. Wilkins and those who had instructed him; and he was prepared to say that, although they preferred the Trust as proposed in the Bill, they considered the importance of dealing with the question of placing the water supply in the hands of a public authority so great that, rather than it should be delayed any longer, they were prepared to accept the proposition of the Committee, that the proposed Statutory Committee should be the Water Authority. The Vestries' Bill provided complete machinery for carrying out the objects and purposes of a central authority, in whose hands the undertakings of the Water Companies should be vested; but the London Water Commission Bill was a mere skeleton of a measure, providing a very heterogeneous Water Commission to deal with the question. He thought that if the Vestries accepted, as they loyally did, the decision of the Committee with regard to the Statutory Committee, as it was competent for them to do, the Committee would be of opinion that the Bill before them was the one with which they ought to proceed.

Mr. MOULTON said it seemed to him that it was most important that there should be a worked-out proposal by the bodies interested—namely, the County Council and the Corporation—of the scheme to which the Committee had already said they felt favourably inclined. It would greatly assist the Committee if they had an authoritative proposition from the people interested; and as the City were willing to alter their Bill in accordance with the arrangement entered into, it would be clearly of advantage that this Bill should come before the Committee. He reminded them that the Water Commission Bill was a Private Bill, and must therefore go through; but the Vestries' Bill was a Public Bill, and might be blocked at any time, and the whole result of the investigation of the Committee be entirely done away with. He therefore thought it was better to go on with the Commission Bill. He could not understand how Mr. Rickards could recommend his Bill as the matured Bill of the Vestries of London, if the mere dictum of Mr. Wilkins would entitle him to turn the Bill inside out, and reject its vital principle with regard to the constitution of the Trust. He felt, no doubt, that they would be able so to alter the Commission Bill as to get rid of all difficulty, after the announcement the Committee had made that morning; and he suggested an adjournment to enable that Bill to be put into an acceptable form, embodying the arrangement come to. The Committee could then decide what course they would follow.

Mr. RICKARDS pointed out that both Sir T. Farrer and Mr. Cripps had declared their inability to propound any definite scheme——

Mr. MOULTON: That is absolutely without foundation.

Mr. RICKARDS (continuing): As to what outside authorities they should take, and other matters.

The CHAIRMAN said there was a preliminary matter about which the Committee would like to be informed. Supposing the Commission Bill, which was a Private Bill, and might have a reasonable chance of passing this session in some form or other, were taken, would it be possible to put into that Bill any clauses with reference to powers of purchase.

Mr. RICKARDS: No; certainly not. It is not within the notices.

The CHAIRMAN said that was exactly the point he wanted to get at.

Mr. LITTLER observed that, without getting a suspension of the Standing Orders, it would not be possible to include powers of compulsory purchase; but purchase by agreement might be included. They could not, as against the Water Companies, and without their consenting to do it, allow the insertion of clauses for compulsory purchase. They would be the only people affected by want of notice. But certainly they could have authority to purchase by agreement and next year they could apply for compulsory power, if in the meanwhile they had not agreed. No time would be lost, for this reason: Even supposing there were a compulsory purchase, there would have to be an Act of Parliament for buying out the Companies; and, failing agreement, they could come next year for powers of compulsory purchase.

Mr. MOULTON remarked that the instruction to the Committee by the House gave them wide powers.

Mr. PEMBER: Yes; but it did not include purchase.

The CHAIRMAN said the Committee would give an opportunity to the promoters of the Vestries' Bill and the other parties to come to some agreement; and for this purpose they would adjourn till two o'clock the next day. The Committee would then like to have the proposals of the Corporation and the County Council in the form in which they would submit the Private Bill; and they would then be prepared to come to a decision as to whether they would go on with it or with the Vestries' Bill.

Mr. BALFOUR BROWNE said he was exceedingly anxious, whoever had the supply of water in their hands, to be heard on behalf of the Hertford County Council with regard to the water which they needed for their own purposes. He asked the Committee to look into past legislation as to the conditions upon which the Water Companies took away water from Hertfordshire which the inhabitants of the county required for themselves.

The CHAIRMAN said he had already explained that time alone would prevent the Committee from going into that very large question.

Mr. BALFOUR BROWNE said he did not want the Committee to go into the general question; but this was cognate to the one with regard to which they had withdrawn what they had said about taking water from the Thames. It was connected with that very point as to whether the Companies should go on pumping water from Hertfordshire.

The CHAIRMAN said he thought they had not time to go into that matter. He would consider it with his colleagues before the next day; but he believed the Committee had clearly come to a decision that the great question of the present supply and the possibilities of an additional supply being required, and also whether or not too much water was being taken at different places, was too large for that Committee, at any rate, to take up with any hope of coming to a proper decision. As to the proposal to take over the works of the Leatherhead and Rickmansworth Water Companies, they felt they could not go into that subject; and, without expressing any opinion adverse to the proposition, or as to what was to be done, they said they would not insert it in the Bill before them. This was really leaving the question to the Committee's successors, or to some other body.

Mr. PEMBER remarked that he should have to give an enormous mass of evidence on behalf of the Water Companies upon such a matter as that, as, if there was a decision against them, they would have to go to Wales, or to some other district, to replace the water.

Mr. BALFOUR BROWNE remarked that he understood one of the things still open in the mind of the Committee was as to whether or not there should be any more water taken from the Thames.

The CHAIRMAN said this was not so. They declined, as a Committee, to go into that matter at all. Mr. Pember had said that to deal with it involved the taking away of parliamentary powers of a large Company supplying East London. Such an inquiry was not necessary in settling the very important question of what was to be the future water authority for London. He thought the best thing to do for Mr. Browne's clients in Hertfordshire was to inform them that, as far as this question went, they could disappear from the view of the Committee. The Committee were anxious that the parties should come, if possible, with substantial proposals on the following day; and then they would give a decision as to whether they would proceed with the Public or the Private Bill.

Sixteenth Day—Thursday, June 11.

On the re-assembling of the Committee this afternoon,

Mr. LITTLER said he was sorry that no *modus vivendi* had been arrived at between the promoters of the Commission Bill and the Vestries. He did not think the Committee would care to go into the details of the efforts that had been made to do this, but would rather desire to know what it was that the City, in conjunction with the County Council, were proposing. He brought before them the Bill of the Corporation, altered, so far as they could possibly alter it, to meet all the objects which could be met in the present session, and to carry out the views expressed by the Committee. He proposed to amend the preamble, and to embody the agreement that had been arrived at by the Corporation and the County Council.

The CHAIRMAN said it could not be held that the Committee had done more than express the view that this proposal afforded a basis of discussion—nothing further than that.

Mr. LITTLER read the amendments made in the Bill, which, in addition to the constitution of the Statutory Committee, gave power to the County Council to introduce Bills in Parliament for the compulsory purchase of the Water Companies' undertakings.

The CHAIRMAN said the Committee had not yet decided whether or not they would take this Bill.

Mr. LITTLER proceeded to say that the County Council were desirous of inserting a clause providing for purchase forthwith by agreement; and to this the Corporation had no objection. There was not the same difficulty with regard to the Standing Orders for purchase by agreement as there would be with respect to compulsory purchase.

Mr. PEMBER expressed doubts as to the possibility of this reference to purchase being covered by the notices for the Bill; and he urged that the authorities of the House should be consulted on the matter.

A long discussion followed as to which Bill should be proceeded with; and the Committee were engaged for some time in private consultation on the matter. On the re-admission of the public,

The CHAIRMAN said the Committee felt that it was altogether unlikely that any legislation could take place this session; but, subject to that, they considered, on the whole, that they would proceed with the Vestries' Bill. If he understood the promoters of that Bill, if the Committee ultimately decided upon the basis proposed by the County Council and the Corporation, this would be consented to by the promoters, and therefore they would go on with the evidence as indicated by the Committee on the previous day—namely, upon the points as to the constitution of the Water Authority, the representation of the outside areas, and the questions which arose in connection with the purchase of the water undertakings by agreement or otherwise. The opposition of the County Council to the Vestries' Bill would therefore be continued. He added, in reply to a question put by Mr. Rickards, that they would not exclude a proposition from the Vestries for a Nominative Trust. They had distinctly stated that they regarded the proposals of the Corporation and the County Council as a basis which would enable them to report to the House in favour of something on those lines, or on the lines suggested by the promoters.

The Committee then adjourned.

On the following Tuesday, Mr. Binnie was recalled, and further examined by Mr. Freeman in support of the case of the London County Council. His examination and cross-examination occupied nearly the whole of the sitting. Dr. E. Frankland, F.R.S., was the next witness; and, in reply to the same Counsel, he said he did not think it would be expedient, just, or equitable, to force an immediate purchase of the water undertakings. The sitting then closed. The next morning, further evidence of a technical character was given by Mr. G. H. Hill, M. Inst. C. E., Water Engineer of the Manchester Corporation. He was followed by Mr. C. Harrison, Chairman of the Parliamentary Committee of the London County Council, who confirmed generally the evidence given by Sir T. Farrer. This brought the sitting to a close. On the following morning, Mr. G. F. Deacon, M. Inst. C. E., Engineer to the Liverpool Corporation, under whose supervision the Vyrnwy scheme for the supply of water to that city has been carried out, gave his experience as to the working of a water undertaking in the hands of a Municipal Authority. Then Mr. H. L. Cripps, the Parliamentary Agent for the London County Council, was recalled, and produced further correspondence from the Local Authorities within the Council's area. Mr. Richards next addressed the Committee on behalf of the East Ham Local Board; and Mr. Meysey Thompson, in support of the case of the Richmond Corporation against the Bill. Further evidence was then given, and the day's proceedings closed. On the following Tuesday (the 23rd), Earl Cowper, the Chairman of the Hertfordshire County Council, spoke as to the serious effect the proposals of the Bill would have upon the present scarcely adequate supply of water in his district; and Mr. Littler, Q.C., as Chairman of the Middlesex County Council, set forth the views of this body on the water question. Mr. Fletcher Moulton, Q.C., and Mr. Balfour Browne, Q.C., then addressed the Committee on behalf of the County Councils of London and Hertfordshire; and the inquiry was adjourned. The next day, other learned Counsel having submitted the cases of the various parties they represented, Mr. Pember, Q.C., for the Grand Junction and East London Water Companies, stated that he was prepared to call evidence showing that the Water Companies had done their duty in the past, and were prepared to meet all emergencies that might arise in the future. If it was decided that the Companies should be bought out, he asked that they should be bought as a whole, and that the purchase should be made compulsory. The learned Counsel concluded his address on the following morning, and was succeeded by Mr. Balfour Browne, Q.C., for the Lambeth Company, who asked the Committee not to allow the Bill to proceed. Mr. G. A. R. Fitzgerald then addressed the Committee for the Chelsea and West Middlesex Water Companies; Mr. Coward, Q.C., on behalf of the Kent Water Company; Mr. Bidder, Q.C., for the Southwark and Vauxhall Water Company; and Mr. Pope, Q.C., for the New River Company. The last-named Counsel put it to the Committee whether it would not be better to report to Parliament that the question was so surrounded with difficulty that it must be attacked under different circumstances, and with power to make a more extended inquiry than was possible this session. If, however, Parliament thought there was a public necessity for the adoption of the scheme, contained in the Bill, then they had the right, though the Companies did not want to part with their undertakings, to deal with the property subject always to the cardinal rule, that that which had been given by Parliament should be acquired at its fair value. At the close of the day's proceedings, the Chairman intimated that evidence on the part of the Water Companies formally tendered by Mr. Pember and Mr. Balfour Browne could not then be accepted. The morning of Friday—the 23rd day of the inquiry—was occupied mainly with the speech of Mr. Rickards in support of the Bill. He declared that it represented a *bona fide* effort to settle the water question on behalf of the people of London; and he asked that, whatever the decision as to the preamble might be, the London ratepayers should be called upon to pay the cost of its promotion. After deliberating in private, the Chairman announced that the Committee found the preamble of the Bill not proved, and that they had come to a similar decision with regard to the London Water Commission Bill, promoted by the Corporation of the City of London. They would proceed to consider a special report, which they would lay before the House. With reference to the application for costs, they thought the Bill of the Vestries, as well as the other Bills, had been promoted with perfect *bona fides*, and with the view of advancing the public interest; but they had no power to deal with the question of costs. In reference to the Water Companies' Charges Bill (which was backed by Mr. Causton and other Metropolitan members), it was intimated that there was no appearance; and Mr. Pember, Q.C., for the Water Companies, suggested that the Committee should find the preamble not proved. The Chairman said he thought it would be well to communicate with Mr. Causton before taking this step. In regard to the only other Bill on the list—the Croydon Water Bill—it was announced that its promotion depended entirely upon the passing of either the Corporation's or the Vestries' Bill; and, as both had been rejected, it would not be proceeded with. The protracted inquiry then closed; and the Committee adjourned until to-day, when they will consider their report. The proceedings here briefly summarized will be dealt with more fully next week.

Bursting of a Liverpool Water-Main.—Early last Thursday morning a 3-feet water-main running from Prescot to Liverpool burst near the Knotty Ash Railway Station. The rent in the ground was 4 or 5 feet in length and 3 feet in width; and the station was flooded. The supply of water had to be discontinued for a time; but it was expected the mischief would be repaired, and the supply resumed yesterday.

The Vyrnwy Water Supply.—All work in the permanent tunnel underneath the Mersey at Fiddler's Ferry was suspended last week; but many of the workmen were engaged in sinking a shaft on the banks of the river. On Monday afternoon water broke in the tunnel, heralding itself by a thunderous boom as it forced its way through the sand. The workmen, hearing the warning noise, made their escape; but the force of the air threw one man against the iron segments, and he was severely hurt. The mishap was not regarded as very serious; but it has caused a considerable amount of difficulty.

Extension of the Baildon Water-Works.—The commencement of operations in connection with the Baildon Water-Works extension scheme was formerly inaugurated last Tuesday. The scheme is of an extensive character; and the water available upon its completion is estimated to meet the requirements of the district for the next thirty years. The parliamentary powers were obtained in 1890, since which time preparations have been made for water-works, which are estimated to cost £16,000, and will afford storeage capacity amounting to an additional 30 million gallons. The area of the land acquired for the proposed reservoir is about 21 acres. The basin will cover an area of about 8 acres at the top-water level. The reservoir embankment will be 54 feet at its greatest height; and the greatest depth of water will be 36 feet. The plans of the proposed reservoir have been executed by Mr. B. Walker, Engineering Surveyor to the Local Board. The ceremony of turning the first sod was performed last Tuesday by the Chairman of the Board (Mr. T. M. Holmes), who was presented with a handsome spade by Mr. J. Young (of the firm of Messrs. J. and T. Young, of Leeds, the contractors). Afterwards a dinner was served in the Board-room, followed by congratulatory speeches.

New Water Scheme for Gloucester.—At last Tuesday's meeting of the Gloucester Town Council, a report by Mr. W. Fox, C.E., as to possible sources of water supply for the city was considered. Mr. Fox calculates that there should be a provision of 1,140,000 gallons a day to meet the wants of the city during the next twenty years. With reference to an increased supply, he deals with nine schemes. Of the pumping schemes, he says that from Newent is to be preferred, taking into consideration the greater probability of procuring the required amount of water of good quality. Comparing this with the gravitation projects, it is cheaper than either the Crickley or Cranham scheme. He recommends that if the Corporation consider 600,000 gallons is not too much to eventually provide for, the Newent scheme be adopted, provided that the result of trial boring should show that a sufficient quantity of good water can be obtained. Should the result not be satisfactory, and should the Corporation be of opinion that something less than 600,000 gallons per day is sufficient, he considers that they should adopt the Crickley scheme in combination with tunnelling. This report was considered by the Finance, Estates, and Water-Works Committee, who passed a resolution declaring it to be desirable to exhaust all practical sources of supply in the neighbourhood of Witcomb before seeking to obtain water in any other locality; but that before making any recommendation to the Council, Mr. R. Etheridge, F.R.S., be consulted as to the geological questions arising from Mr. Fox's report. The result of a long discussion was that the Council confirmed this resolution.

Mr. S. Hayward and the Salford Gas Frauds.—Mr. Samuel Hayward, "C.E.," whose name it will be remembered was constantly brought forward in connection with the investigation into the frauds in the Salford Gas Department, has written a letter to the Mayor of Salford, again claiming payment for the work that he states he has done. The letter, which was dated from the Outer Temple, Strand, runs: "I understand that it is proposed to divide among the three districts of the county borough of Salford the sum of £9278 18s. 4d.; being the net sum yet received from the frauds committed upon the Salford ratepayers in connection with the Corporation gas-works. My view is that your Corporation would not have received a shilling of this sum but for the investigations I conducted; and this view is held by many who are competent to give an opinion. My attempt to recover payment of a portion of the amount due to me was resisted on the ground that my engagement with the Investigation Committee was not under the Corporation seal. I was engaged continuously for nearly six months, and discovered great frauds, of which this £9278 is but a particle. If your Corporation are prepared to continue the investigation and proceed against all defaulters, without respect of persons, I am prepared to assist such further investigation with all the information and proofs in my possession. If, however, the Corporation wish the matter, so far as they are concerned, to end where it is, I shall be glad to have payment for the six months' work done." On two occasions since this letter was forwarded—on May 21 and June 11—Mr. Hayward has written to the Mayor asking for a reply; but up to yesterday week, when the three communications were published, no notice had been taken of them by his Worship.

MISCELLANEOUS NEWS.

THE GAS AND WATER PROVISIONAL ORDERS FOR THE PRESENT SESSION.

The Board of Trade have issued Memoranda stating the nature of the proposals contained in the various Gas and Water Provisional Orders included in the Confirmation Bills now before the House of Commons.

The Gas Orders Confirmation Bill comprises the Orders relating to Cirencester, Godstone District, Matlock and District, and Staines and Egham. The Cirencester Order is to empower the Cirencester Gas Company, Limited, to maintain and continue gas-works, and to make and supply gas in the parishes of Cirencester and Stratton, both in the county of Gloucester; also to fix the capital at £25,000 by shares and £6250 by loan, and the price to be charged for gas at 4s. 3d. per 1000 cubic feet, with sliding scale as to price and dividend. The Godstone Order is to authorize the Godstone District Gas Company, Limited, to construct and maintain gas-works, and to make and supply gas within the parishes, districts, and places of Godstone, Tandridge, Crowhurst, Blindley Heath, Lingfield, Dorman's Land, and New Chapel, all in the county of Surrey; to fix the capital at £12,000 by shares and £3000 by loan, and the maximum price to be charged for gas at 5s. per 1000 cubic feet, with power to the Board of Trade, after the expiration of three years, to alter the maximum price or to substitute a sliding scale of price and dividend. The Matlock and District Order is to enable the Matlock and District Gas Company, Limited, to maintain and continue gas-works, to make and supply gas within the parishes of Matlock, Darley (consisting of North and South Darley), Wensley, Snitterton, and Tansley, all in the county of Derby, and to supply gas in bulk by agreement without the limits of supply; to fix the capital at £26,200 by shares and £6550 by loan, and the price to be charged for gas at 4s. 3d. per 1000 cubic feet, with sliding scale as to price and dividend. The Staines and Egham Order is to empower the Staines and Egham District Gas and Coke Company, Limited, to include within their limits of supply parts of the parishes of Ashford and Stanwell, in the county of Middlesex. The Memorandum in relation to this Bill states that the Orders contain, where necessary, the usual clauses as to the sale of additional capital by auction or tender, limits of dividend, the creation of insurance and reserve funds, the illuminating power and testing of gas, the quantity of land to be taken by agreement, &c., and they also incorporate the Gas-Works Clauses Acts, 1847 and 1871.

The Water Orders Confirmation Bill comprises the Orders relating to Corsham, North Sussex, Rochford, Rayleigh, Leigh, and Swaffham. The Corsham Order is to empower the Corsham Water-Works Company, Limited, to raise £2000 additional capital by shares, and £500 by loan. The North Sussex Order is to confer power upon Mr. L. F. Palmer, of East Grinstead, and Mr. S. J. Palmer, of Newcastle-on-Tyne, to construct and maintain water-works; to supply water in parts of the parish of Worth, in the county of Sussex; to supply water in bulk by agreement beyond the limits of supply; and to fix the capital at £10,000 and the amount to be borrowed at £2500. The Rochford, Raleigh, and Leigh Order is to enable the South-East Essex Gas and Water Company, Limited, to construct and maintain water-works; to supply water within the parishes of Rochford, Rayleigh, Leigh, and Hockley, in the county of Essex; to supply water in bulk by agreement beyond the limits of supply; and to fix the capital at £18,000 by shares and £4500 by loan. The Swaffham Order is to authorize the Swaffham Water-Works Company, Limited, to maintain and continue their existing water-works; to supply water in the parish of Swaffham, in the county of Norfolk; to supply water in bulk by agreement beyond the limits of supply; and to fix the capital at £4000 by shares and £1000 by loan. The Memorandum in respect to this Bill states that the Orders incorporate, where necessary, the Water-Works Clauses Acts, 1847 and 1863, and contain the usual clauses as to regulations for preventing waste, misuse, or contamination of water, supply of water by measure, quantity of land to be taken by agreement, &c. In each case in which additional capital is authorized, it is required to be offered for sale by auction or tender. The rates are to be based upon the rateable value of the houses, as ascertained by the valuation list.

MANCHESTER CORPORATION GAS SUPPLY.

Committee's Annual Report.

The report of the Manchester Corporation Gas Committee for the year ended March 31 was issued last week.

The Committee stated that the quantity of coal and cannel carbonized during the year was 346,915 tons; being an increaseof 44,385 tons, or 14·7 per cent., compared with the previous year, an exceptionally large increase, and such as to tax the power of the works to the fullest possible extent. This increase is partly attributable to the freer use of gas consequent on the reduction in price in townships recently included in the city, the more extended use of gas for domestic and trade purposes other than illumination, and the larger quantity of gas required for extended and improved street lighting, but mainly to the long-continued dark and cold weather of the past winter. There were 3,301,680,000 cubic feet of gas transmitted from the works, being 9517 cubic feet of gas per ton of coal and cannel carbonized. The total quantity of gas accounted for is 3,189,128,000 cubic feet; leaving for loss by condensation, &c., 112,552,000 cubic feet, or 3·41 per cent. The average illuminating power of the gas was 19·26 candles. The number of cookers and gas-fires out on hire at the end of the year was 2245, by which it is estimated that 21,000,000 cubic feet of gas were consumed, chiefly in the day time. There are 12,076 public lamps in the city, of which 1420 are of the improved pattern, and 120 lamps are now fixed in dark courts and passages. The total value of the gas consumed in public lighting was £22,386. The Committee also report that a number of "prepayment" meters of several makers have been tested, and 34 have been fixed, and are now in use. The results have not yet been altogether satisfactory; but it is hoped that, as the consumers get more accustomed to their proper use, and the defects which experience shows to exist are overcome, the use of these meters in cottage houses may be safely promoted. The number of gas consumers in the city is 64,734, and beyond the city 14,745; making a total of 79,479, or a net increase of 877. The Committee also report that, notwithstanding the increased cost of labour and materials, and the reduction in the price of gas in the recently incorporated townships, the financial results of the year's working have been satisfactory, and the profits realized have considerably exceeded anticipation. The total revenue of the Gas Department from all sources was £488,424; being £54,073 more than in the preceding year. The gas rental amounted to £389,590; being an increase of £29,058, or 8·06 per cent. The amount received for tar was £30,842, and for ammoniacal liquor £22,763; being respectively £5431 and £6735 in excess of the previous year. The amount received for coke is especially noticeable; being £43,849, or an increase of £13,364. This result has been obtained by careful attention on the part of the Committee and the responsible officials. It is also satisfactory to report that the greater quantity of this coke has been sold for use in Manchester and the immediate neighbourhood, and has no doubt tended to materially decrease the production of black smoke. The gross profit for the year was £97,276; and after paying the usual fixed charges for interest, sinking fund, and providing for the street lighting, the net profit amounts to £47,545, out of which there has been paid to the city fund £10,000, the adverse balance of £26,277 has been cleared off, and the sum of £11,268 has been carried forward to renewals account. It is worthy of remark that the bad debts amount to only £519, or 0·1 per cent. on the gross revenue.

As to the supply of electricity, the report says: It has already been reported to the City Council that the Provisional Order for the supply of electricity within a certain prescribed area of the city has been obtained. The Committee now further report that this subject has received careful and thoughtful attention. They desire to carry out this Order in the most efficient and satisfactory manner; and with this view they have visited a number of important electric installations in London and elsewhere, and have been in communication with several eminent electrical engineers for advice and suggestive reports. When these reports have been examined and decided upon, the recommendations of the Committee will be submitted to the Council. The Committee assure the Council that there will be no avoidable delay in making this illuminant available to the public.

A special report is appended on the question of a reduction in the price of gas. The resolutions of the Council of May 6 have had careful consideration; and the Committee assure the Council that they are in favour of gas being supplied to consumers at as cheap a rate as possible, as is evidenced by the past reductions in the price of gas from time to time. In order to prepare the way for a further reduction in the price of gas, the City Council recently adopted a change of policy by which, as from March 31 last, the department will be relieved of the direct cost of public lighting, and the charge which has hitherto been made for depreciation. This change having been made, the Committee are prepared at the right time to carry out the policy initiated to its proper issue. The Committee desire to lay before the Council for consideration the following particulars relating to this question: During the past winter the supply of gas was not equal to the demand, and much inconvenience was caused to the public generally, and especially to the users of gas for motive power and trade purposes. An unusually large increase in the consumption of gas continues to this date; and if the reduction in the price of gas were at once made, and a further large increase in the consumption of gas resulted, the demand could not be met. With the view of at once carrying out the opinions expressed by the Council, and of fully meeting the demand for gas, the Committee are adopting new and improved methods of carbonizing, and providing effective and economical machinery. A second retort-house is also in process of preparation, at the Bradford Road Gas-Works, for being filled with retort-settings on the most approved principle. Steps have been already taken to increase the holder capacity of the works. It is estimated that the total cost of these extensions and renewals will be as follows: Rochdale Road Gas-Works, retort-house, &c., £30,000; Bradford Road Gas-Works, new retort-house, £25,000; Gaythorn Gas-Works, repairs to and trebling of holders, £12,000; new gasholder, tank, and connections, £50,000; street mains departments, mains, &c., £15,000—total, £132,000. A portion of this increased gas-making and holding power will be in use next winter, but it will not be until the winter of 1892-3 that the full power will be available. Under these circumstances, the Committee do not recommend that any reduction be made in the price of gas during the current financial year. When the estimates for next year are before the Committee and the Council, this question will be further considered and reported upon, by which time the result of the extension of works above referred to as in progress can be fairly estimated, and the power to fully supply the demand for gas will then become available.

NOTTINGHAM CORPORATION GAS SUPPLY.

The Gas Profits and Reserve Fund and the Borough Finances.

The Nottingham Town Council yesterday week had before them the "budget" for the ensuing year, and a proposal of the Finance Committee that a district rate of 4s. 6d. in the pound be levied. Alderman Goldschmidt, in the course of his remarks in moving the adoption of this proposition, said that the Committee suggested the appropriation out of the profits of the gas undertaking for the year ending March 31 last of the sum of £25,000, and out of the profits of the water undertaking the sum of £2500, in relief of the estimated expenditure. He also mentioned that while the Council had a shrinking income, they had at the same time an increasing expenditure; and said that if the Gas Department could give them £30,000 instead of £25,000 a year, it would greatly diminish their difficulties. Sheriff Brownsword, in seconding the motion, said he thought the Gas Committee should hand over a larger sum than at present. He did not see why they should accumulate money in the way they did, instead of

handing it over to the ratepayers' account. That was a thing he did not understand. Last year the Gas Department contributed £23,600; and the Water Department, £1000. This year the Gas Committee had voluntarily offered to give £25,000; but their profits last year, after putting everything to revenue, including the expense of new retorts, were £26,800, independent of the interest on the reserve fund—bringing the total up to £30,544. Then there were other balances which he had not taken into account; so that if the Committee liked to give them the real profits, there would be nearly enough to wipe off the adverse balance of the year. He recommended that idea to the Chairman of the Committee, and hoped he would give the matter his favourable consideration. With regard to the charge for gas, many people recommended—chiefly, he believed, the large consumers—that they should take off 2d. per 1000 cubic feet; but he did not think they had exactly made out how it could be done. By such a reduction, a few of the large consumers of gas outside would get it cheaper; but the average middle-class people would have to pay 4d. extra per 1000 feet. A reduction of 2d. would take £10,000 off the profits, and the incidence of that would fall principally upon the small occupiers and middle classes, who would have to make up the reduction. It was well known that in Nottingham the gas was equal to any in the country, superior to that of most towns, and considerably lower in price, and therefore there was nothing to grumble at. Alderman Ford remarked that Mr. Sheriff Brownsword said they ought to hand over some of the profits of the gas undertaking to the ratepayers; but he could assure the members that, in accumulating their reserve, it was practically handing it over to the ratepayers. The gas undertaking was carried on as a commercial concern; and the Committee endeavoured as far as possible to make the best of it. They had a reserve fund of something like £100,000; and this belonged to the ratepayers, and it would not be a wise thing to touch it. Mr. M'Craith did not agree with the remarks of Mr. Sheriff Brownsword when he said that the gas undertaking existed for the benefit of the ratepayers. He ventured to think that they acted somewhat unfairly towards the large gas consumers. It would be an advantage to the employers as well as to the employed to reduce the price of gas; and they ought not to take so much as they annually did out of the pockets of the large consumers. Mr. Green ventured to advocate the application of some of the gas reserve fund to the necessities of the borough. This fund was, he said, set aside to meet any contingency which might arise in connection with the gas undertaking. The money might or might not be wanted; and he said that if £12,000 was required, the town would be able to find it when it was needed just as it was able to find it then. He suggested that they ought to wipe away the deficiency of £12,000; and there was nothing for them but to appropriate some of the gas reserve fund. He moved, as an amendment—"That the Council appropriate £12,000 from the gas reserve fund to defray the present deficiency in the borough finances." Mr. Sharkey seconded the amendment. The time had come, he said, for the Council to take into consideration the ratepayers and the state of the town; and he thought the gas reserve fund should contribute this sum of £12,000. Alderman Goldschmidt observed that they must not vote lightly on this matter of £12,000. Mr. Woodward thought they would be doing something very unsound in touching the reserve fund. Eventually Mr. Green, with the consent of his seconder, withdrew the amendment; and the report was adopted.

MALTA AND MEDITERRANEAN GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Tuesday, at the London Offices, No. 60, Gracechurch Street, E.C.—Mr. J. Birch Paddon in the chair.

The Secretary (Mr. A. W. Cooper) read the notice convening the meeting; and it was agreed to take as read the report of the Directors and the statement of accounts for the year ended March 31 last, which were referred to in the Journal for the 2nd inst. (p. 1083).

The Chairman said that he wished, before proposing the first resolution, to refer to some of the incidents which went to make up the history of the Company for the past year. The Directors were fortunate in having received a report of an inspection of their works at Corfu and Sicily made by Mr. Simmelkjœr. He supposed that no one had a more complete and thorough knowledge of gas enterprise in Southern Europe than that gentleman; and there was the great advantage that he was familiar with the Company's works. Not only that, but their Secretary had made quite a recent visit to the whole of their stations. They had therefore the advantage of the reports of these gentlemen; and he was glad to say they were very satisfactory. Apart from posting the Directors up to the present time in the affairs of the stations, these reports had a valuable confirmatory effect upon the reports which were made to the Board periodically from the stations. At Malta the business seemed to be increasing in all directions; and this was chiefly due to the intelligent energy of their General Manager (Mr. Starkey). He had endeavoured to popularize the use of gas in every possible way—by introducing new patterns of fittings, and the best burners and stoves; and the result had been a considerable addition to the business. Of course, this brought with it its obligations; and the Company had to provide the gas which was required in consequence of all these efforts. The year before last, they erected a new gasholder; last year they were engaged in putting up fresh retorts; and they were now supplying other necessary plant—such as purifiers, boilers, &c.—and also in laying new mains, to convey the increased quantity of gas into the districts where it was needed. In all these things, the Directors had had two objects in view. The first was the abandonment of the works at Calcara, and the bringing of the manufacture of gas entirely to Valletta; and the second was the extension of the gas supply to the adjoining district of Sliema. With regard to the first object—that of doing away with the works at Calcara, he might say that the reasons for so doing increased every year, while the reasons against (which at one time were almost equal) were gradually disappearing; and the concentration of the works was now, he might say, within a measurable time. The extension to Sliema was a matter which the Directors had had under their attention for several years. It was strongly urged upon them some years ago by the late Governor of Malta and his advisers. Sliema was an adjunct of Valletta, which was densely populated, and was bound to increase rapidly in size. The extension there at present was a matter rather of policy than of commercial considerations. As to the "commercial considerations," the Directors were satisfied, and had every reason to believe, that in a reasonable time, the new district of Sliema would be a profitable one. In consequence of these things, they had had to make applications to the Government; and he was bound to say that these had been received with the utmost consideration. It had always been the policy of the Board to endeavour to meet the wishes of the Government as far as possible; and in this case the Government had readily given the Directors all the facilities that were required. Matters had not been so satisfactory at Corfu. The contract for public lighting expired in December next; and they had endeavoured to get it renewed, but the Municipality were, like similar bodies nearer home, enamoured of the electric light. They were advised that it was cheaper, and much more valuable for public lighting, than gas. However, they would probably, some time or other, go through the same experience as many provincial towns in England had done; and by the time they came to the end of that experience, it was quite certain they would find electricity was not cheaper or more valuable than gas for public lighting. Meantime the question remained in suspense. Probably the most important subject in connection with Corfu was the reduction which the Directors had made in the price of gas. Had it not been for the approaching termination of the contract, there would have been a reduction at an earlier date; but it had now been made, and the Directors had nothing to regret in regard to it. As to the public lighting, it was not a matter of very great moment to the Company, for the price was low; and when to that was added the adverse weight of the exchange, it really did not matter very much to them whether or not they procured the new contract. The reports which the Board received from Sicily were very satisfactory indeed. At Trapani they had an increase of business of 5·41 per cent., and at Marsala of 4·67 per cent. For a long time past the Directors had endeavoured to obtain a readjustment of the prices paid for the public and private lighting there; the difference being very great. They proposed that, if a small addition were made to the price paid for public lighting, they would take at least three times that amount off the charge for gas used for private purposes. These terms worked out in a very attractive way to the Municipality; but, after considering them, they were unable to adopt them. Then the Directors had to consider whether it was wise to maintain a prohibitory price for gas for private consumption, or come down to a more moderate sum; and, as a result, they decreased the price from 11s. to 7s. 6d. per 1000 cubic feet. The accounts the Directors received encouraged them to hope that the complete recoupment of the price would take place in a short period. Turning to the accounts, the Chairman said that, on the debit side of the statement of profit and loss, the shareholders would find a considerable increase in comparison with last year. The item of coal was £604 more; but this was amply justified by the larger quantity of gas sold; and the same remark would apply to all the items with the exception of two or three. The first one was maintenance, which was much in excess of what it was last year. He believed the difference was £1669, which was made up of an expenditure of £1209 on the new retorts erected at Valletta, and a number of small items. With regard to this, he would remind the proprietors that it was proposed to abandon the works at Calcara; and that new works at Valletta were intended to take their place. Although these were rather heavy charges to revenue, the Directors were assured it was the proper thing to do, and they had to do something still further in this way, because this expenditure was not equal to the value of the works they were going to discard. Reference was also made by the Chairman to the outlay for the inspection of the stations (£155), and to the smallness of the bad debts and allowances (£10 12s. 11d.); and then he said that, dividing the total expenditure by the quantity of gas sold, it would be found that it worked out to a less figure per 1000 cubic feet of gas sold than in the preceding year, notwithstanding the additional charges. On the other side of the account, they had the results of the working. They used 10,139 tons of coal, which was an increase of 821 tons. From this quantity of coal, they manufactured 104,153,000 cubic feet of gas, which was at the rate of 10,272 feet per ton. Of this production, 94,742,000 feet were sold, or 9344 feet per ton, leaving a difference of 9,411,000 feet, or 9 per cent. unaccounted for, including the gas burned at the whole of the Company's stations. Having mentioned that the increase in the gas-rental amounted to £1896, in the receipts for residuals to £652, and in those for fittings, meters, &c., to £350, the Chairman proceeded to remark that in the general balance-sheet, it would be seen that the figures as to capital were exactly the same as in the previous year. Ten years ago—in 1881—the Company sold 57 million cubic feet of gas, and the capital was then £158,448; and in the past year they sold 95 million cubic feet, while the capital was £149,115, or just £9333 less than ten years ago, and yet they were distributing nearly double the quantity of gas. This had been brought about by the extinction of debentures; and the reserve fund had been used for this purpose. But they could not carry on this pleasant state of things any longer. They had gone as far as they possibly could; the demand for new works had arisen, and in order to complete them, further capital would be needed. So far as they could see at the present time, the enlargement they were practically committed to would cost them something like £10,000. But that was not all, the Directors had for a long time earnestly desired to invest the reserve fund separately; and that desire he believed was shared by many of the proprietors. Although it was a sort of financial luxury, it was a very proper thing to be done; and the Directors thought that the time had arrived when an attempt should be made to invest all or part of the reserve, and capital would have to be called up for the purpose. There was one other matter to which he wished to refer. It would be seen by the accounts that they had a balance of £7469, of which dividends would absorb £4802, and leave £2667 to be carried forward. Many shareholders would perhaps think the time had come when the ordinary capital ought to receive a higher dividend; but there was much to be considered. First of all they desired that this dividend, small as it was, should be at least a permanent one. If

it altered in any way, it should simply become larger, without having to fall back again. The superiority of the outcome of the accounts now submitted was due to two things. The first was that they had been able to get coal at a price very much below the present value; and the next was that of the large increase. The first of these causes was at an end, or very nearly so. The second, he was glad to say, presented a great deal of encouragement for the future; but they had this year to provide for the extra cost of coal, and that at 3s. per ton, after deducting something for the stock which had been bought at old prices, would stand them in about £1000. The reduction of price at Corfu and Sicily represented £1500 more. They would require to raise at the very least £10,000 additional capital, and they would need, for the purpose of dividend, £600, and if they invested the reserve fund £870 more. So that they had £3970, or £4000, to provide for. Against that they had £2667 which was carried forward. If the reserve fund were invested, it would be earning money; and they would not require to make such large contributions from revenue as they had hitherto done. That made this year £1500. Therefore with the increase they expected to realize in rental, they would be able to satisfactorily meet an equal dividend for next year. If they disposed of any of the surplus now carried forward, then they reduced this certainty; and that would not be at all acceptable to the shareholders. In conclusion, he moved the adoption of the report and accounts.

Colonel J. Le Geyt Daniell seconded the motion, which was unanimously carried, without discussion.

Resolutions were then passed declaring dividends (including the interim payment) of 7 per cent. on the first preference capital, of 7½ per cent. on the second preference capital, and of 6 per cent., free of income-tax, on the ordinary shares.

On the motion of Mr. Stephenson R. Clarke, seconded by Mr. Dodgson, Mr. J. Orwell Phillips, the retiring Director, was re-elected.

Mr. Magnus Ohren proposed, and Mr. Smith seconded, the reappointment of Mr. R. Hesketh Jones as an Auditor; and the proposition was agreed to.

The Chairman observed that the next business was the election of an Auditor in place of the late Mr. Alfred Hersee; and he could not let the opportunity go by without expressing the great regret of the Directors—and he had every reason to believe this regret would be shared by the proprietors generally—at his sudden death. Mr. Hersee had been associated with the Company for very many years; and the performance of his duties left nothing to be desired.

Mr. T. Guyatt was then unanimously elected to the vacant position, on the motion of Mr. Clarke, seconded by Mr. Ohren.

A vote of thanks to the Chairman and Directors and the Secretary and staff concluded the proceedings.

LIGHTING OF WOODSTOCK (CAPE TOWN) WITH GAS.

We learn from a copy of the *Cape Argus* which has lately come to hand that the works which were commenced about two years and a half ago for the lighting of the Municipality of Woodstock (adjacent to Cape Town) with gas have been completed, and that the town was lighted for the first time on the 23rd of April. The project, it may be remembered, was initiated by the South African Gas Company; but this Company, as many of our readers are aware, has lately amalgamated with the Cape Town and District Gas Company, and the two sets of works will henceforth combine their forces. The result will, of course, be a better supply of gas generally. It would appear, at first sight, that the inhabitants of the district have been kept waiting a long time for the boon which has now been bestowed upon them; but we learn that the delay was not due to any want of energy on the part of the Company who then had the matter in hand, or of their Engineer in Charge (Mr. W. Arnot). There was, it seems, some delay in the completion of the ironwork and machinery. Nevertheless, Mr. Arnot did not remain idle while waiting for his plant, but put in all his mains; so that nothing is left but to attach the services as fast as supplies are needed. The works consist of a retort-house, containing three benches of six retorts, 9 ft. 6 in. long, heated on the regenerative system; an exhauster-house, containing an exhauster worked by a 3-horse power horizontal engine; a boiler-house, in which all the steam required on the works is generated; a washer and scrubber; a station meter capable of passing 7500 cubic feet of gas per hour; and a two-lift holder, 63 feet in diameter and 36 feet high, having a capacity of 83,000 cubic feet, and working in a cast-iron tank, 18 feet deep. The meter-house is furnished with the necessary governor. The works were erected by a local contractor (Mr. Maxwell) from the designs of Messrs. Stevenson and Birstall, of Parliament Street; the first-named gentleman having been appointed Engineer of the Company on its formation a few years ago.

The Water Supply at Mansfield.—The present water undertaking at Mansfield, our readers may remember, was purchased from a Company some time ago by the Improvement Commissioners. It became necessary to provide a more adequate supply of water; and Mr. Hodson, C.E., was consulted. The result has been that a new scheme is now proposed, at an estimated cost of £24,929. The new source of supply is on ground at Rainworth, belonging to Lord Saville, where an abundance of excellent water, it is stated, has been found.

Electric Lighting for Cambridge.—The Cambridge Town Council a short time since held a special meeting, at which they considered a resolution proposed by the Electric Lighting Committee to the effect that, in the event of their report on the subject being adopted by the Council, they be authorized to conclude contracts for carrying out the electric lighting of the town; it being understood that the total cost should not exceed £26,500, and that the installation should suffice for 5000 lights of 16-candle power, or their equivalent. The discussion, after a few members had spoken, was adjourned until Monday, the 15th inst., when there was a long debate on the subject, in the course of which several members showed some anxiety as to whether the undertaking would pay. The resolution, however, was agreed to; and Professor W. Garnett was appointed Electrical Engineer to carry out the scheme.

METROPOLIS WATER SUPPLY.

The Quality of the Water in May.

The returns furnished to the Registrar-General by the London Water Companies as to the water supply of the Metropolis during the past month show that the average daily supply was 179,908,849 gallons, as compared with 179,880,869 gallons in the corresponding month of 1890; being at the rate of 29·8 gallons per head of the population. Of the entire bulk of the water sent out, 90,160,945 gallons were drawn from the Thames, and 89,747,904 gallons from the Lea and other sources. Reporting upon the quality of the supply, Dr. E. Frankland said: "Taking the average amount of organic impurity contained in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies and by the Tottenham Local Board of Health was: Kent, 0·8; Colne Valley, 1·1; New River, 1·3; Tottenham, 1·4; East London (deep well), 2·2; East London (river supply), 2·5; Chelsea and West Middlesex, 2·7; Grand Junction, 2·8; Southwark, 2·9; and Lambeth, 3·1. The water abstracted from the Thames by the Chelsea, West Middlesex, Southwark, Grand Junction, and Lambeth Companies contained, in every case, less organic carbon and nitrogen than last month. It was of superior quality to the water delivered from the same source in April. It was efficiently filtered. The water taken chiefly from the Lea by the New River Company ranked, in respect of organic purity, with the deep-well waters; and that delivered by the East London Company from the same source was superior, in this respect, to any of the Thames-derived waters. Both waters were efficiently filtered before delivery. The deep-well waters of the Kent, Colne Valley, and East London Companies, and of the Tottenham Local Board of Health, were all of excellent quality for dietetic use; and the Colne Valley Company's water, having been softened before delivery, was rendered suitable for washing. All these waters were clear and bright without filtration. Seen through a stratum 2 feet deep, the Kent, Colne Valley, Tottenham, and East London (deep-well) waters were clear and colourless; the New River and East London, clear and nearly colourless; and the remaining waters, clear and very pale yellow. The bacteriological examination by Dr. Koch's process of gelatine plate culture gave the following results. One cubic centimetre of each water collected in sterilized vacuous tubes, on the same days as the samples for chemical analysis, developed the following number of colonies of microbes: West Middlesex, 20; Southwark, 26; New River, 30; East London, 48; Grand Junction, 64; Chelsea, 78; Kent, 116; and Lambeth, 404."

Messrs. Crookes, Odling, and Tidy, in their report for the past month on the composition and quality of samples taken daily of the water supplied to London, say: Of the 175 samples examined, the whole were found to be clear, bright, and well filtered. The condition of the water supply to the Metropolis during the month of May was throughout entirely satisfactory, and was characterized more especially by the marked degree of freedom from brownish tint of the water, and by the great uniformity of composition and character among the different samples examined. Thus the mean amount of organic carbon present in the Thames-derived supply being 0·136 part, the maximum amount in any single sample examined was found to be only 0·150 part in 100,000 parts of the water. The following table shows the comparable results furnished by the examinations of the Thames-derived water made during the past three months respectively:—

	Ratio of Brown to Blue Tint. Means.	Oxygen required for Oxidation. Means.	Organic Carbon per 100,000 Parts. Means.	Organic Carbon per 100,000 Parts. Maxima.
March . . .	14·1 : 20 ..	0·049 ..	0·146 ..	0·209
April . . .	13·9 : 20 ..	0·055 ..	0·155 ..	0·190
May . . .	9·6 : 20 ..	0·042 ..	0·135 ..	0·150

The Maidstone Water-Works Purchase Question.—At a meeting of the Maidstone Local Board last Wednesday, the Clerk read a letter from Mr. C. A. Case, Secretary to the Maidstone Water Company, stating that the Company had carefully considered the offer of £130,000 for the purchase of the water-works, but were unable to accept it. Mr. Cox said he was sorry to hear the answer, which was, however, only what he had anticipated. His proposal had been to offer £135,000; and he should certainly bring on the subject at the next meeting of the Board.

Litigation as to the Mersey Tunnel Contract.—In the Queen's Bench Division of the High Court of Justice, a few days ago, the case of *Newell v. The Corporation of Liverpool* came before the Lord Chief Justice and a special jury. It was an action by Mr. J. Newell of Liverpool, to recover from the Corporation a sum of £28,474, made up in this way: For work done in constructing a tunnel under the Mersey, £16,949; loss of profits in consequence of the defendants putting an end to the contract, £11,000; detention of plant, £525. The allegation of the plaintiff was that he with Mr. Monk (deceased) undertook the contract upon the representation of the defendants that there was at a certain depth under the Mersey a bed of boulder clay which was impervious to water, and through which the tunnel (which was for the purpose of laying water-pipes in connection with the Vyrnwy scheme) could be driven. But this turned out to be altogether wrong; and the tunnel could not be driven on the conditions of the contract. On the plaintiff pointing this out to the Corporation, they determined the contract, and confiscated the plaintiff's plant and material. The defendants claimed the right under the terms of the contract to do what they had done, and counter-claimed in respect to extra money they had to pay to a new contractor. The case for the plaintiff having been opened, his Lordship suggested that the question was one for reference; and, after a consulation between Counsel, it was agreed to take a verdict for the plaintiff, subject to a reference (the terms of which had been arranged) to an eminent engineer with a legal assessor. The jury returned a verdict accordingly.

NOTES FROM SCOTLAND.

From our Edinburgh Correspondent.

EDINBURGH, *Saturday*.

I must confess to being most agreeably surprised at the favourable result of the past year's working of the Edinburgh and Leith Gas Commission. The accounts were published on Tuesday; and before going further I may say that this year the common-sense method was adopted of sending out copies of the accounts instead of allowing garbled statements to appear, which is a step in the right direction. The debit balance on the year is only £347 8s. 11d. In this matter I am quite pleased to admit that I have been mistaken; because, from calculations I made, I anticipated a deficit of about £2000. Your readers will remember, however, that I exercised caution in putting forward my conclusions, as all the data were not before me. I seem to have erred in not allowing a sufficient rise in the returns for residuals. These, I find, produced £8607 more than was received in 1889-90—a sum sufficient to turn the balance a good deal one way or another. The total revenue rose from £219,253 to £259,264—an increase of £40,011. Of the revenne, £229,807 was derived from the sale of 1,248,524,600 cubic feet of gas; or an increase of £32,195 upon a consumption which was 97,952,600 cubic feet larger than in 1889-90. Residuals yielded £29,630, as compared with £21,023; or an increase, as stated above, of £8607. On the expenditure side, the total outlay amounted to £212,812, against £161,293 in 1889-90—an increase of £51,519. Of this amount, coal is accountable for £112,975, as compared with £74,693—an increase of £38,282; purifying materials rose from £5889 to £7146—an increase of £1257; and salaries and wages in the works, from £33,084 to £37,370—an increase of £4286. These three heads account for about £44,000 of increased expenditure; the remainder being made up of outlay upon maintenance and repairs, and upon the redistributive operations going on. While the revenue account for the past year shows a gross profit of £47,142, that for the previous year showed a gross profit of £57,960; so that for last year the gross profit is, notwithstanding the magnificent business which was done, £10,818 less than it was in 1889-90. The Commissioners have, however, this consolation that, had it not been for the rise of nearly £5000 in wages which was forced upon them by their employees last autumn, and the loss of nearly £600 by the railway strike, their gross profit would have been quite equal to what it was a year ago. At the beginning of the past year the Commissioners framed their estimates cautiously, carrying forward their balance of £14,916 to meet an expected deficit on the year's working. Had it not been for the outside influences mentioned above, this precaution would have been, considering their great increase of business, altogether unnecessary, because there would have been a balance on the year of about £10,000. As it is, the £14,916 is only called upon to the extent of the £347 of deficit; and there is thus left of the amount which was carried forward last year, £14,569, and that sum the Finance Committee have agreed to recommend should again be carried forward. The £47,142 of gross profit is to be utilized for payment of £34,000 of annuities, and of £5175 of interest on mortgages, &c., which will leave £7967. But of that sum there falls to be set aside £7267 10s. as a sinking fund for the redemption of annuities, and £1046 19s. 8d. as sinking fund for repayment of borrowed money—together £8314, or £347 (the amount of the debit balance) more than the funds available; and that sum will be taken from the £14,916 brought forward from 1889-90. The Commissioners meet on Monday to consider the recommendations of the Finance Committee; and when all things are taken into account, they will have every reason on their side if they should indulge in a little jubilation over their attainments.

A justification of the action of the Dundee Gas Commissioners in appointing an analyst was given at the Dundee Trades' Council on Wednesday night, by Mr. Councillor Ritchie, a member of the Gas Commission; and as I wrote somewhat antagonistically to the step when it was taken, I feel obliged to give the statement with some fullness. Mr. Ritchie said that during the past year a very large quantity of coal passed through the hands of the Commission. This was purchased on the analytical report of the different collieries, and was supposed to yield a certain percentage of gas. After it had passed through the retorts, it was found that the coal did not contain the percentage of gas which was alleged. This year a different course had been adopted in the buying of coal; and instead of the Manager purchasing it, as in the past, the Committee had done so. On the buying of coal this year a considerable saving had been made. The colliery proprietors had signed their contracts, and the Commission was determined that the coal should be up to the specified standard. The result had been that an analyst had been appointed, who would devote his whole time to the gas-works, and analyze every consignment of coal entering it; so that they would always see whether the quality contracted was being maintained. The analyst would not be in any way responsible to the Gas Manager, but, on the contrary, would answer only to the Commission. The whole cost of the analyses, however, would not amount to more than a farthing per ton on the coal passing through the gas-works. A good deal had been said as to the appointment of a local man to this position. He knew there was a certain local gentleman who considered that he should have got the appointment; but he knew at the same time that had he been appointed he would not have devoted his full time to the work, but would have sent a boy to perform it. The man appointed was a practical gas manager, a man who was as competent to manufacture gas as any gas manager in Great Britain. Had the appointment been advertised, there was no question whatever that a great amount of local influence would have been brought to bear to force some inexperienced individual into the position. What they wanted was a practical man; and there was no man in Dundee they could really appoint to the position who had the practical experience necessary.

The Gas Committee of the Aberdeen Town Council transacted an unusual amount of business on Wednesday. In the first place, it was reported to them that the illuminating power of the gas on 19th inst. was 23·71 candles, which is a considerable improvement on what was reported a few weeks ago. The Committee considered a petition by 19 labourers in the gas-works for an increase of wages from 18s. to 20s. per week. It was reported to the Committee that, besides the 19 in the petition, there are 12 labourers who receive 19s. a week; and the Committee agreed to advance the 19 petitioners by 1s. per week, making all the labourers uniform in the matter of wages. Then the question of the dismissal of men from the gas-works, which has been a text for Socialist agitators for some time, came up. The Convener, Bailie M'Kenzie, explained, that the men were not dismissed because they had given information to a Socialist, but for good reasons; and he moved that that reply be sent to the party who had communicated the resolutions which were adopted at the open-air meeting held under Socialist auspices a few weeks ago. Strange as it may appear in a meeting of men who have undertaken an obligation to do their best for the gas undertaking, two of their number thought that a Sub-Committee should look into the matter, which meant that whenever anyone chose to get up an agitation about the management of the gas works, everything connected with the internal management of the works was to be made public. This would not be the correct way to carry on business. Everything connected with the policy of the body it is the right of the community to know; but the details as arranged by the officials are part of the working of the business, which it is no one's right to know, unless he can allege maladministration. The proposal to have an inquiry before a Sub-Committee was therefore wisely rejected by four votes to two. Thereafter Mr. Pratt called the attention of the Committee to one of the replies to queries given by Bailie M'Kenzie in the Town Council three weeks ago, with reference to the number of men employed in the retort-house, and the wages paid to them. He (Mr. Pratt) found that 25 fewer men were employed in April of this year, when the stoking machinery was working, than in April of last year, before it was started; but that the wages paid last year gave an average of 19s. 9d. per man per week, whereas the wages paid this year averaged 28s. 6d. per man. He failed to see how such a difference should exist. Mr. A. Smith, the Gas Manager, said that Mr. Pratt knew quite well; but Mr. Pratt retorted that he did not know. Mr. Smith declined to be "drawn;" and after a heated discussion, the Convener said that Mr. Pratt might obtain his information from Mr. Smith privately, and if he did not satisfaction he might bring the matter before the Committee. This was tantamount to saying that the Committee declined to give a handle to Socialist agitators—a decision for which I consider they are to be commended.

From our Glasgow Correspondent.

GLASGOW, *Saturday*.

The Glasgow Corporation (Partick, Hillhead, and Maryhill) Gas Bill has this week passed through all its stages in the House of Commons, as an unopposed measure. It may therefore almost be set down as having become law. In the course of a very few days the two gas concerns that have been purchased by the Glasgow Corporation Gas Commissioners will formally pass into their hands. I refer to that of the Partick, Hillhead, and Maryhill Gas Company, and that of the Pollokshaws Gas Company. I may mention that at the last meeting of the Finance Sub-Committee on the Gas Trust, the Chairman (ex-Bailie M'Laren) was authorized to sign a cheque for £14,602 2s. 10d., in payment of the purchase price of the last-named undertaking, and for the legal expenses connected with the transference of the same to the new owners.

On the same day, the Sub-Committee on Works had under consideration an offer to purchase the tar and liquor at the Pollokshaws Gas-Works for one, two, and three years, at an initial price of 3s. 4d. per ton of coal carbonized, and upon other terms and conditions, so far as applicable, as are contained in the current contracts for the residual products at the Dawsholm and Tradeston gas-works. The Committee agreed to accept the offer for a period of one year, with power, however, to terminate the contract within that period, in the event of the Corporation ceasing to manufacture gas at the works.

The Directors of the Bothwell and Uddingston Gas Company have just issued a very favourable annual report. It deals with the Company's affairs for the year ending April 30, and states that the balance at the credit of revenue account this year, after writing off for depreciation of works and plant and bad debts, amounts to £1213 17s. 7d., which, added to £918 10s. 9d., the balance brought forward from last year, gives a total amount at credit of profit and loss account of £2132 8s. 4d. Owing to the continued increase of business, the Directors have entered into contracts for the construction of a new tank and gasholder, which, when completed, will more than double the present storeage capacity, and provide for future increased consumption for several years to come. The contractors commenced operations some time ago; and already the work of excavating the tank is well advanced, and the necessary substantial wall is nearly finished. This work is being executed according to the plans and specifications of the Company's Manager, Mr. Laurence Hislop, who is an "old hand" at gas engineering. He is likewise a servant in whom the Directors have most thorough confidence. Notwithstanding the fact that the Directors have had to enter into new contracts for gas coal at advancing rates, they do not contemplate making any increase in the selling price of gas. This is an excellent example of a well-managed gas concern of the smaller description; and the Directors deserve well of the shareholders for the ability and attention which they give to the Company's affairs. It may be remembered that if was at Uddingston that the experiment was tried of making and using water gas about a couple of years ago; but the trial seems to have been of no avail, except in the way of taking money out of the pockets of Mr. Samson Fox and his fellow shareholders. Certainly the local Gas Company never had any fear of water gas competing with the commodity which they manufacture.

As in the case of the Company just referred to, so is it with the Stewarton Gas Company (an Ayrshire concern), the great advance in the price of coal has not made it necessary for the Directors to recommend to the shareholders an increase in the price of gas. At the annual meeting of the Company, which was held last Tuesday evening, it was agreed to declare a dividend of 7s. 6d. per share; and it was formally resolved that the price of the gas should not be increased.

The Directors of the Annan Gaslight Company, in their annual report to the shareholders which has just been prepared, state that the cost of coal has further advanced, and that there has been considerable

increase in the receipts from gas and sale of residual products. They recommend that the dividend this year be declared at the rate of 12s. per share on the capital stock of the Company.

Business has been quiet this week in the Scotch pig iron trade. Very little has been done in Scotch warrants, the prices of which have been comparatively steady. There has been a limited number of transactions in Cleveland and hematite warrants at somewhat higher rates. Of fresh speculation, there is practically none in the market; and the London syndicate is being allowed to hold its own. All current requirements are now easily met from the ironworks; and the output has been so much increased that there will be a constant surplus to go into store. The exports of pig iron are increasing, although still much less than they were at the same time last year. Prices of ordinary pig iron and of makers' special brands have varied little since last week, but the tendency is a shade easier. Yesterday's closing quotations for Scotch warrants was 47s. 1d. per ton cash buyers.

A fair amount of business has been passing lately in the Glasgow and West of Scotland coal trade, but supplies are heavy, and sellers are generally anxious to do business. Prices of main and splint coals are easier; and the former can be bought at about 3d. per ton cheaper on the week.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *June 27.*

Sulphate of Ammonia.—The transactions this week have been of small compass; and in the continued absence of a consumptive demand, quotations are very irregular. £10 15s. is considered the highest value; and buyers generally seem to be in no mood to pay even this price—anticipating a still further decline. The present unexpected drop in values has marred the intention of consumers to secure forward supplies; and they seem now to have made up their minds to wait events. It is meanwhile stated that July-September deliveries can be bought at £11. Nitrate is steady at 8s. 7½d.

LONDON, *June 27.*

Tar Products.—The continued fall in price, which has been going on for the last two or three months, seems to have been checked for the present. Although business in any of the products is anything but brisk, there is some firmness in the market; and makers, being pretty well covered with contracts, are either not offering, or are demanding a shade over the prices quoted below. Carbolic acid is being shipped in considerable quantities; but the price continues low and unprofitable. Stocks of common oils have been largely reduced; and makers are now pretty easy respecting them—the large shipments to America having no doubt relieved the abnormal stocks which existed a few weeks ago. Anthracene is dull, in sympathy with the wretched condition of the dyeing trade. Solvent naphtha has not been so low at this time of the year for many years. There is an excellent demand for the article; but buyers refuse to pay any higher price for it. Several important tar contracts have been let during the week, at prices ranging between 23s. 6d. and 30s.—having regard to position and conditions of delivery. The shipments of pitch have been stopped by the warmer weather. New business has been done for next season at from 33s. to 34s. 6d. Other values are: Benzol, 90's, 3s. 8d.; 50's., 2s. 8d. Toluol, 1s. 7d. Solvent naphtha, 1s. 4½d. Crude naphtha, 1s. Creosote, 1½d. Carbolic crystals, 6d.; crude, 60's, 1s. 3d. Cresol, 8d. Anthracene, "A" quality (nominal), 1s. 4d.; "B" quality, 10½d.

Sulphate of Ammonia.—This article goes from bad to worse. Notwithstanding the small make, new business is difficult to obtain; and it is always wanted by buyers at a lower price. Contracts as low as £10 12s. 6d. have been noted; and the market price to-day in any position is not above £10 15s., less the usual discount. Gas liquor, is quoted at 4s. 6d. to 5s. 9d.

THE LANCASHIRE GAS COAL TRADE.

From Our Own Correspondent.

Generally prices throughout the coal trade of this district remain fairly steady, at about the basis referred to in my previous reports; and it would now seem improbable that buyers are likely to obtain further concessions to any very appreciable extent beyond those which have already been secured. The summer is now considerably advanced; and it is only in very exceptional cases where stocks of any quantity have been put down. In fact, taking the collieries generally throughout the district, little or nothing of any weight has so far gone down into stock; and the men, in one way or another, so combine to restrict the output that it is tolerably certain colliery owners will enter upon the ensuing winter exceptionally bare of stocks as compared with previous seasons. In view of this, there is no inducement to push surplus supplies upon the market at lower prices; and in the Manchester district the leading firms are anticipating that they will have no difficulty in maintaining their winter rates all through the summer, so far at least as round coals are concerned. There has been some little weakening in the West Lancashire district; but so far any actually announced reductions have been confined to comparatively few collieries, and to one or two descriptions of coal. Possibly during the ensuing winter this may be followed by some reduction in other quarters, where prices have not given way; but there is no indication of any general reduction in prices. I have already pointed out the extent of the concessions which have been obtainable in gas coals; and this corresponds pretty nearly with the course of prices with regard to other descriptions of round coal. Last year a good many contracts were settled on a sliding scale basis—that is, the price at which they were then accepted was subject to an advance of 4d. per ton following upon every further 5 per cent. advance in wages to the men. In August last year, the men received an additional 5 per cent. increase; and following upon this the contract prices were advanced 4d. per ton. This year these contracts are being renewed on the basis of the prices at first accepted last year—that is, less the 4d. per ton advance, which had to be paid upon the increase in wages in August, which, of course, represents practically a concession of 4d. per ton. But the colliery owners are not bound by any sliding scale with regard to wages; and in the event of any reduction in wages, the contract prices would be maintained. Other contracts which were settled without the sliding-scale basis, have been renewed at reductions of 3d., and in some cases 6d. per ton upon last year's rates. This represents practically the extent of the concessions that have been made, or that are likely to be made, in renewing contracts for next year. With regard to gas coal, the further contracts that have been concluded have generally been at prices ranging from 3d. to 6d. per ton under last season's rates; but one or two important contracts in the district are still pending. For screened gas coals, prices at the pit's mouth may be quoted at from 9s. 6d. for some of the lower qualities up to 10s. for the best descriptions, with screened Arley gas nuts averaging 9s. per ton at the pit's mouth. As to pit prices for other descriptions of fuel, these are being well maintained at late rates; best Wigan Arley coal, which is exceptionally firm considering the season of the year, being still quoted at 12s. to 12s. 3d. per ton. It is only in very exceptional cases where anything under these figures is being taken; whilst in one or two special instances, colliery proprietors are still holding to 12s. 6d. as their quotation. Second qualities of Arley average 10s. 6d. to 11s. per ton; Pemberton 4-feet coals, 10s. to 10s. 6d.; and common house-fire coals, 9s. to 9s. 6d. In the lower descriptions of round coal, a slackening off in the demand for iron making and general manufacturing purposes is necessarily having some weakening effect upon prices, and supplies of these are more plentiful. But there is no generally quotable giving way upon late rates; and at the pit mouth, steam and forge coals average 8s. to 8s. 6d., with 7s. 9d. per ton taken in some instances. For shipment, common steam coals average 9s. to 9s. 6d., with better qualities fetching 9s. 9d. to 10s. per ton delivered at the High Level, Liverpool, or the Garston Docks. The chief weakness in the market is in the commoner descriptions of engine fuel, which have been a drag for some time past, and are pushed for sale in some cases at almost any figure. The better qualities, however, move off fairly well, and maintain about late rates. At the pit mouth, the better qualities of burgy are fetching 7s. 3d. to 7s. 6d.; and best qualities of slack, 6s. to 6s. 6d. But common sorts of burgy can be bought at 6s. 9d. to 7s.; and inferior descriptions of slack, from 3s. 9d. to 4s. 3d. per ton.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 1310.)

Issue.	Share	When ex-Dividend.	Dividend or Div. Bonus.	NAME.	Paid per Share.	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	10 Apl.	10½	Alliance & Dublin 10 p. c.	10	15½—17½	..	6 0 0
100,000	10	,,	7½	Do. 7 p.c	10	11½—12½	..	6 0 0
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	100—108	..	4 12 7
100,000	20	28 May	8	Bahia, Limited	20	14—16	..	10 0 0
200,000	5	13 May	7½	Bombay, Limited	5	6½—7	..	5 7 1
40,000	5	,,	7½	Do. New	4	4½—5½	..	5 14 1
380,000	Stck.	26 Feb.	12½	Brentford Consolidated	100	220—225	..	5 8 10
125,000	,,	,,	9½	Do. New	100	160—164	..	5 12 10
220,000	20	12 Mar	11½	Brighton & Hove Original	20	40—42	..	5 9 6
320,000	20	10 Apl.	11½	British	20	43—45	..	5 0 0
50,000	10	12 Mar.	11	Bromley, Ordinary 10 p. c.	10	18—20	..	5 10 0
39,000	10	,,	8	Do. 7 p. c.	10	13—15	..	5 5 8
328,750	10	13 Nov.	6	Buenos Ayres (New) Limited	10	7½—8½	..	—
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	95—100	..	6 0 0
150,000	20	26 Feb.	8	Cagliari, Limited	20	25—27	..	5 18 6
550,000	Stck.	10 Apl.	13½	Commercial, Old Stock	100	255—265	..	5 3 9
130,000	,,	,,	10½	Do. New do.	100	195—205	..	5 4 10
130,000	,,	26 June	4½	Do. 4½ p. c. Deb. do.	100	119—121½	+½	3 12 7
557,320	20	11 June	13	Continental Union, Limited	20	46—48	−1	5 8 4
242,680	20	,,	13	Do. New '69 & '72	14	—	..	—
200,000	20	,,	10	Do. 7 p. c. Perf.	20	37—38	..	5 5 3
75,000	Stck.	25 Mar.	10	Crystal Palace District	100	200—205	..	4 17 7
480,090	10	28 Jan.	4†	European, Limited	10	20½—21½	..	—
354,660	10	,,	4†	Do. Partly paid	7½	15—16	..	—
5,470,630	Stck.	12 Feb.	13	Gaslight & Coke, A, Ordinary	100	234—239	+1	5 8 9
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	96—99	..	4 0 9
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	255—260	..	3 16 11
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	120—125	..	4 0 0
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	175—180	..	4 3 4
1,300,000	,,	,,	7	Do. H, 7 p. c. max	100	160—164	..	4 5 4
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	253—258	..	3 17 6
476,000	,,	,,	—	Do. K, 6 p. c. Prf.	100	154—158	..	3 16 0
1,061,150	,,	11 June	4	Do. 4 p. c. Deb. Stk.	100	112-115	..	3 9 7
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	120-125	..	3 12 4
908,000	,,	,,	6	Do. 6 p. c. do	100	163-168	..	3 11 5
3,800,000	Stck.	13 May.	12	Imperial Continental	100	223-228	..	5 5 3
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	5	4½—5*	..	6 0 0
560,000	100	1 Apl.	5	Met. of Melbourne, 5 p. c. Deb.	100	110—112	..	4 9 3
541,920	20	11 June	6½	Monte Video, Limited	20	17½—18½	..	7 0 6
150,000	5	28 May	10	Oriental, Limited	5	8½—9½	..	5 8 1
60,000	5	25 Mar.	7	Ottoman, Limited	5	4½—5½	+½	6 7 3
166,870	10	26 Feb.	2	Pará Limited	10	3—4	..	—
420,000	100	4 May	6	People's Gas of Chicago— 1st Mtg. Bds..	100	92—97	..	6 3 9
500,000	100	1 June	16	2nd Do.	100	90—95	..	6 6 4
150,000	10	28 Apl.	10	San Paulo, Limited	10	15—16	..	6 5 0
500,000	Stck.	26 Feb	15½	South Metropolitan, A Stock	100	282—287	..	5 8 0
1,350,000	,,	,,	12	Do. B do.	100	238—243	+1	5 18 9
166,500	,,	,,	13	Do. C do.	100	242—250	..	5 4 0
678,000	,,	26 June	5	Do. 5 p. c. Deb. Stk.	100	139-143*	+½	3 10 0
60,000	5	12 Mar.	11½	Tottenham & Edm'nton, Orig.	5	11—13	..	4 8 5
				WATER COMPANIES.				
729,281	Stck.	26 June	10	Chelsea, Ordinary	100	260-270*	+5	3 14 1
1,720,560	Stck.	10 Apl.	8	East London, Ordinary	100	212—217	..	3 13 9
544,440	,,	26 June	4½	Do. 4½ p. c. Deb. Stk.	100	138-143*	..	3 3 0
700,000	50	11 June	8	Grand Junction	50	107—111	−1	3 12 0
708,000	Stck.	12 Feb.	10½	Kent	100	265—270	..	3 17 10
1,043,800	100	26 June	9½	Lambeth, 10 p. c. max.	100	235-240*	..	3 19 2
406,200	100	,,	7½	Do. 7½ p. c. max.	100	192-197*	−1½	3 16 2
260,000	Stck.	25 Mar.	4	Do. 4 p. c. Deb. Stk.	100	118—123	..	3 5 0
500,000	100	12 Feb.	12½	New River, New Shares	100	347—352	..	3 8 10
1,000,000	Stck.	28 Jan.	4	Do. 4 p. c. Deb. Stk	100	125—128	..	3 2 6
902,300	Stck.	11 June	6½	S'thwk & V'xhall, 10 p. c. max.	100	167—171	..	3 16 0
126,500	100	,,	6½	Do. 7½ p. c. do.	100	160-165	..	3 18 9
1,155,066	Stck.	11 June	10	West Middlesex.	100	250-260	..	3 16 11

*Ex div.

† Interim dividend.

The Electric Lighting of the City of London.—The Brush Electrical Engineering Company, Limited, who have been entrusted by the Commissioners of Sewers with the lighting of an area embracing about two-thirds of the City of London, last Thursday night publicly demonstrated, on a comparatively limited scale, the nature of the installation they intend to put down. The experiment took place in Queen Victoria Street, where 26 arc lamps, worked from two dynamos, driven by a 20-horse power (indicated) steam-engine, were kept alight from nine till eleven o'clock. The gas was, of course, extinguished all along the street during the trial. The electric lanterns are placed on the tops of plain iron columns 19 feet high and 120 feet apart. It will be for the Commissioners of Sewers, whose representatives witnessed the experiment, to report whether or not the lanterns and columns meet with their approval.

The Electric Lighting Question at Hull.—The Queen's Ward Ratepayers' Association of Hull held a meeting last Tuesday week, at which they considered the expediency of the Corporation entering into the supply of electricity. After a full discussion of the matter, they unanimously adopted a resolution protesting against the Corporation exercising their powers in the adoption of the electric light, and urging that the powers should be allowed to lapse. At the meeting of the Town Council on the 18th inst., Dr. Holder, as Chairman of the Electric Lighting Committee, moved the adoption of the minutes of that body, which included a recommendation that the Committee be empowered to at once take the necessary steps for laying down an installation on the low tension system, as may be found desirable, at a cost not exceeding £22,000. He spoke at some length in support of the proposed scheme, and criticized the proceedings at the meeting of the Ratepayers' Association above referred to—pointing out that those who influenced it were interested in the existing gas-works.

Sales of Gas Shares.—Yesterday week, at the Mart, Tokenhouse Yard, E.C., Mr. Alfred Richards sold by auction 1000 £10 shares in the *Lea Bridge Gas Company*, ranking for dividend of 7 per cent., and being part of the further additional share capital authorized by the Company's Act of 1878. The prices realized were as follows: 370 shares sold at £13 15s.; 50 at £13 10s.; 310 at £13 5s.; 80 at £13 2s. 6d.; and 190 at £13. It is announced that on the 27th prox. Mr. Richards will sell, at the same place, 250 fully-paid £5 shares in the Romford Gas Company.——At a sale at Bury St. Edmunds last Thursday, eleven £10 shares of the 1859 capital in the *Bury St. Edmund Gas Company* fetched £20 and £21 apiece.——Twenty new £10 shares (£6 paid) in the *Pontefract Gas Company* were sold yesterday week by public auction at £11 1s. each.——Thirty £50 shares in the *Rochester, Chatham, &c. Gas Company* have just changed hands at an average price of £112 each; and some "B" shares of £12 10s. each, paying 7 per cent., have realized £20 each. Fifty-three £20 shares in the *Gravesend Gas Company* have lately been sold for £2173.

Northern Coal Trade.—The coal trade is easier for the time; but local holidays have lessened the supply of coal, and thus there is a little more scarcity in quantity. Best Northumbrian steam coal is about 12s. 6d. per ton, free on board; and most of the collieries have fairly good turns on. Second-class steam coal and small steam are rather easier in price; but a sharper demand for export is expected soon. Gas coal is in fair request for export; but the local consumption is very low, though each week should add to it now, and should increase the demand on the collieries. There are considerable complaints as to the working of short time on the part of the miners, which limits the supply. The price of gas coals varies much—from about 9s. to 10s. being the current quotations. Some of the local contracts have been concluded a few pence under the former figure. The contracts for the supply of the Middlesbrough Corporation Gas-Works are to be again tendered for—this time by collieries only. There are still considerable quantities asked for in the market; but some of the largest owners of collieries have very little free coal to offer just now. Bunker and manufacturing coal is much more abundant—some factories having been idle for the greater part of the local race week. For coke the demand is rather better; and about 16s. 6d. free on board is the price for export. Gas coke is not altered; but it is noticeable that some of the cement makers have of late been trying other kinds of fuel.

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HANDBOOK

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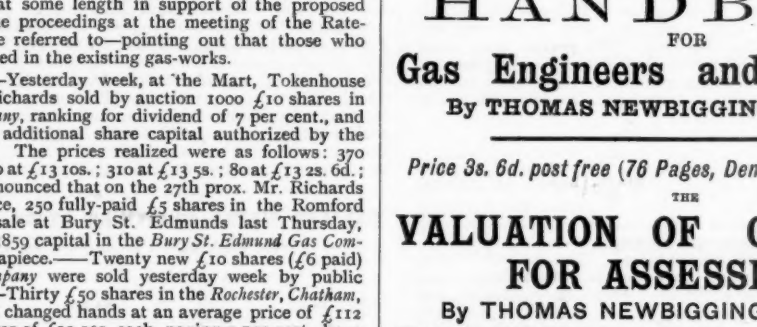

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Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

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Apply, with testimonials, to the undersigned.
HY. SIMMONDS, Engineer.

WANTED, a Working Foreman in a Gas-Works making about 8 million cubic feet of Gas per annum. Must have had good practical experience in Carbonizing, Fitting, Main and Service laying, and repairs connected with Gas-Works generally. Good testimonials required.
Apply, stating age, wages, &c., to W. BEALE, Secretary, Gas Company, Royston, HERTS.

WORKING Foreman wanted, for a Gas-Works in the Midland Counties, making 45 millions per annum. Must be a good Mechanic, competent to do ordinary repairs to Machinery, understand the setting of Retorts, and have a thorough knowledge of the working of Gas Apparatus in general. Wages £2 per week.
Applications to be sent to No. 1966, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

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WANTED, One or Two Cast-Iron SCRUBBERS, 8 or 10 feet diameter.
Particulars to C. READ, Gas-Works, REDHILL.

WANTED, one small Gasholder for Testing purposes, capable of holding from 1000 to 2500 cubic feet, with cast-iron tank complete.
Address T. DUXBURY, Engineer, Gas-Works, DARWEN.

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Quote lowest price f.o.r. or f.o.b., with sketch of Tank, and approximate time of delivery, to No. 1956, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, the following second-hand GAS PLANT in good condition:—
One dozen ⌂ Mouthpieces, 21 in. by 15 in., complete, with 6-inch sockets.
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Apply to H. SMYTHE, Gas-Works, MAIDSTONE.

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*** See Advertisement p. 1336 of this week's issue.
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Inquiries should be addressed to THE AUTOMATIC COAL-GAS RETORT COMPANY, LIMITED, 86-88A, LEADENHALL STREET, E.C.

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CORPORATION OF MOSSLEY.
(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive TENDERS for the surplus TAR produced at the Gas-Works during the Nine months ending the 25th of March, 1892.
Particulars and form of tender may be obtained on application to the Manager (Mr. R. Merrell).
Sealed tenders to be sent to the Town Clerk, endorsed "Tar," not later than the 6th of July.
The Committee do not bind themselves to accept the highest or any tender.
By order,
JOSEPH HYDE, Town Clerk.

CORPORATION OF MOSSLEY.
(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive TENDERS for the supply of 6500 tons of GAS COAL, and 1000 tons of CANNEL.
Sealed tenders to the Town Clerk, endorsed "Gas Coal," not later than noon of the 6th of July.
Particulars and form of tender may be obtained on application to the Manager (Mr. R. Merrell).
The Committee do not bind themselves to accept the lowest or any tender.
By order,
JOSEPH HYDE, Town Clerk.

TO BUILDERS AND CONTRACTORS.

THE Sheffield United Gaslight Company invite TENDERS for constructing an INNER LINING to the existing GASHOLDER TANK, 156 feet diameter by 30 feet deep, at their Grimesthorpe Station. The lining will consist of a Brick, Stone, and Asphalte Wall and Bottom. The Asphalte will be executed under a separate Contract.
Drawings and specification may be seen, and form of tender with bill of quantities obtained, on application to Mr. Fletcher W. Stevenson, the Company's Engineer, on payment of One Guinea, which will be returned on receipt of a *bonâ fide* tender.
The Directors do not bind themselves to accept the lowest or any tender.
Sealed tenders must be delivered, addressed to the undersigned, on or before Monday, the 6th day of July next.
HANBURY THOMAS,
General Manager.
Commercial Street, Sheffield,
June 17, 1891.

TO IRONWORK CONTRACTORS.

THE Sheffield United Gaslight Company invite TENDERS for the supply and erection of Eight PURIFIER COVERS, 27 ft. 4 in. by 19 ft. 11 in., and for taking down, removing, and refixing Three Covers 18 ft. 7 in. square.
Copies of the drawings and specification may be obtained from Mr. Fletcher W. Stevenson, the Company's Engineer, on payment of 10s. 6d.
The Directors do not bind themselves to accept the lowest or any tender.
Sealed tenders must be delivered, addressed to the undersigned, on or before Monday, the 6th day of July next.
HANBURY THOMAS,
General Manager.
Commercial Street, Sheffield,
June 17, 1891.

TO IRONWORK CONTRACTORS.

CONTRACT No. 2.

THE Sheffield United Gaslight Company invite TENDERS for the manufacture and delivery of WROUGHT-IRON HOOPS, VERTICAL GUIDES, and HOLDING-DOWN BOLTS for the existing Gasholder Tank, 156 feet diameter by 30 feet deep, at their Grimesthorpe Station.
Copy of the drawing and specification may be obtained from Mr. Fletcher W. Stevenson, the Company's Engineer.
The Directors do not bind themselves to accept the lowest or any tender.
Sealed tenders must be delivered, addressed to the undersigned, on or before Monday, the 6th day of July next.
HANBURY THOMAS,
General Manager.
Commercial Street, Sheffield,
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HORIZONTAL PIPE CONDENSER.

THE Directors of the Staines and Egham Gas Company, Limited, invite TENDERS for the supply and delivery at the Company's Works at Egham, of a 10-inch HORIZONTAL PIPE CONDENSER.
Plan and specification may be seen, and all particulars obtained, on application to the Company's Manager, Mr. Thomas Webb, at the Works.
Tenders, stating time within which the delivery can be made, to be sent to the undersigned not later than the 1st of July next.
JOHN ANTHONY ENGALL,
Solicitor and Secretary.
Staines, June 19, 1891.

CITY OF CARLISLE.

TENDERS FOR COAL AND CANNEL.

THE Carlisle Gas Committee are pre-pared to receive TENDERS for the supply of about 15,000 tons of Screened or Unscreened GAS COAL, and about 4000 tons of CANNEL, to be delivered at their Works in Carlisle, in such quantities as may be directed, from July, 1891, to June, 1892.
Tenders specifying the description of the Coal or Cannel, the pits at which they are raised, and the terms for net monthly payment, are to be sent on or before July 7, 1891, endorsed "Tender for Coal."
J. HEPWORTH,
Engineer and Manager.
Gas-Works, Carlisle,
June 4, 1891.

CITY OF CARLISLE.

TAR CONTRACT.

THE Carlisle Gas Committee are pre-pared to receive TENDERS for the surplus TAR to be produced at their Works, for a period of One or more years from the 30th of June next.
Any further particulars required can be obtained upon application to the Engineer, to whom sealed Tenders, endorsed "Tender for Tar," must be delivered on or before July 7, 1891.
The Committee do not bind themselves to accept the highest or any tender.
J. HEPWORTH, Engineer.
Gas-Works, Carlisle,
June 4, 1891.

BOROUGH OF NELSON.

THE Gas Committee of the Corporation of Nelson are prepared to receive TENDERS for the purchase and removal from their Works of two WROUGHT-IRON TOWER SCRUBBERS, (internal dimensions 33 ft. by 5 ft. 6 in. diameter), filled with ½-inch boards. Water Spreaders, 10-inch Valves, and Connections all complete. To be sold cheap. Can be seen at any time on the Works.
Tenders, under seal, endorsed "Tender for Tower Scrubbers," to be sent to the undersigned as early as possible.
By order,
R. M. PRESCOTT,
Town Clerk.
Town Hall, June 16, 1891.

THE Directors of the Clevedon Gas Company, are prepared to receive TENDERS for the supply of 500 to 2000 tons of screened GAS COAL or NUTS, to be delivered at the Clevedon Station during the next Twelve months.
Also for the supply of 15 tons of the best OXIDE OF IRON.
Tenders to be addressed to the Chairman of the Company on or before the 4th of July next.
SAMUEL DAWES,
Manager.
Clevedon Gas-Works, June 20, 1891.

COLNE AND MARSDEN LOCAL BOARD.

TENDERS FOR COAL.

THE Gas Committee invite Tenders for the supply of 6000 to 7000 tons of Screened or Unscreened GAS COALS, to be delivered, at the Colne Railway Station Siding, in such Monthly quantities as the Committee may require.
Further information, and particulars of deliveries, can be obtained from the undersigned, to whom sealed tenders, endorsed "Tender for Coal," must be sent on or before Monday, July 13.
HY. SIMMONDS,
Engineer
Gas-Works, Colne,
June 27, 1891.

TENDERS FOR COAL.

THE Directors of the Higham Ferrers Gas Company invite TENDERS for the supply of 400 tons of best screened GAS COAL, to be delivered at the London and North-Western Railway Company's Station, Higham Ferrers, between Aug. 1, 1891, and July 31, 1892.

Tenders to be delivered by July 11, endorsed "Tender for Coal," and addressed to W. Hirst Simpson, Esq., Solicitor, Higham Ferrers.

The Directors do not bind themselves to accept the lowest or any tender.

JNO. T. LEWIS,
Engineer to the Company.

Gas-Works, Wellingborough.

TENDERS FOR COAL.

THE Directors of the Irthlingborough Gas Company invite TENDERS for the supply of from 300 to 400 tons of best screened GAS COAL, to be delivered at the London and North-Western Railway Company's Station, Higham Ferrers, between Aug. 1, 1891, and July 31, 1892.

Tenders to be delivered by July 11, endorsed "Tender for Coal," and addressed to John Saxby, Esq., Chairman, Gas Company, Irthlingborough, Higham Ferrers.

The Directors do not bind themselves to accept the lowest or any tender.

JOHN T. LEWIS,
Engineer to the Company.

Gas-Works, Wellingborough.

TENDERS FOR GAS COAL.

THE Gas Committee of the Newry Town Commissioners invite TENDERS for the supply of from 2800 to 3500 tons of GAS COAL, to be delivered in such quantities as may be required by the Committee, and delivered free *ex* Ship or Steamer at Albert Basin, Newry.

The Coal to be fresh wrought and free from Clench, Pyrites, or other objectionable matter for Gas making.

The Committee would assist the Contractor by allowing him to deliver about 1500 tons of Coal prior to the middle of October next.

Further particulars may be obtained from Mr. A. Gibb, Manager.

Sealed tenders, endorsed "Tender for Coal," specifying the descr ption and quality of the Coal and where raised, to be addressed to the Chairman, Gas Office, Kilmorey Street, Newry, and delivered not later than Thursday evening, the 2nd of July next.

The Committee reserve to themselves the right to accept the whole or any portion of any quantity offered, and do not bind themselves to accept the lowest or any tender.

By order,
JOHN KERNAGHAN, Secretary.

Gas Offices, Newry,
June 19, 1891.

BRIDGNORTH CORPORATION GAS-WORKS.

TO COLLIERY PROPRIETORS AND OTHERS.

THE Gas Committee are prepared to receive sealed TENDERS for the supply of GAS COAL, including carriage to the Bridgnorth Railway Station, as follows:—

(1) For One, Two, or Three years, determinable at the option of the Gas Committee at the end of the first or second year.
(2) For One year only.

Evidence as to the quality of the Coal must accompany each tender.

Quantity required: About 1500 tons per annum, in proportionate deliveries as directed.

The contract to commence at the end of August.

Sealed and marked tenders must be sent to the undersigned not later than Saturday, the 11th of July.

The Committee do not bind themselves to accept the lowest or any tender.

By order,
J. H. COOKSEY, Town Clerk,
Secretary.

Bridgnorth,
June 23, 1891.

TENDERS FOR GAS COAL.

THE Directors of the Clayton, Allerton, and Thornton Gas Company invite TENDERS for the supply of 5000 tons of GAS COAL and 600 tons of CANNEL COAL. The Coal to be Screened, free from Scale, Sulphurous Pyrites, or other objectionable matter, and to be delivered at the Gas-Works, Low Lane, Clayton, or at the Great Northern Railway Station, Clayton, in such quantities weekly as may be ordered by the Company's Manager, during the next Twelve months. The said tenders to state the Seam and the Pit from which the Coal is intended to be sent.

Sealed tenders, endorsed "Tender for Gas Coal," addressed to the Chairman, at the Gas-Works, to be delivered at or before noon on Monday, the 13th day of July, 1891.

The Directors do not pledge themselves to accept the lowest or any tender, reserving to themselves the right to divide the contracts as they may think proper.

By order,
JOHN NIVEN,
Secretary and Manager.

Gas Offices, Clayton,
near Bradford, June 16, 1891.

EAST GRINSTEAD GAS AND WATER COMPANY.

THE Board of Directors wish to receive, on or before the 1st of July next, TENDERS for the surplus TAR.

Applications to be made to the MANAGER, Gas and Water Works, EAST GRINSTEAD.

THE Directors of the Hednesford Gas Company, Limited, invite TENDERS before July 7, 1891, for the surplus TAR and LIQUOR (together and separately), delivered into purchaser's Tanks at Hednesford Station during the year ending June 30, 1892.

THOS. EVANS,
Secretary.

Hednesford, June 24, 1891.

THE Directors of the Hednesford Gas Company, Limited, invite TENDERS for the supply of 1000 tons (more or less) of best GAS COAL, delivered at Hednesford Station in quantities as required, during the year ending the 30th of June, 1892.

Quote for both screened and clean unscreened not later than July 7, 1891.

The lowest or any tender not necessarily accepted.

THOS. EVANS,
Secretary.

Hednesford, June 24, 1891.

NEWARK GAS COMPANY.

THE Directors of the above Company are prepared to receive TENDERS for the supply of 4500 tons of best screened GAS COAL, delivered in such quantities as the Manager shall direct during the Twelve months ending the 1st of September, 1892, at the Company's Siding on the G.N.R. at Newark.

The Coal to be fresh wrought, free from Bats, Pyrites, and other Impurities.

Sealed tenders, marked on the outside "Tender for Coal," and stating the class of Coal, weight, and price per ton, to be sent in to the undersigned on or before the 14th day of July, 1891.

The Directors do not bind themselves to accept the lowest or any tender.

By order,
FREDK. B. FOOTTIT,
Secretary and Manager.

Newark, June 26, 1891.

TO COAL FACTORS AND OTHERS.

THE Directors of the Tunbridge Wells Gas Company will be prepared on Tuesday, the 7th of July, 1891, to receive TENDERS for the supply of 10,000 tons of either NEW PELTON, NEW TANFIELD, EAST PONTOP, SOUTH HETTON, FELLING MAIN, or other approved GAS COALS, at the option of the Directors, to be delivered free on to the Gas Company's Siding on the South-Eastern Railway at Tunbridge Wells, in accordance with terms and conditions which may be obtained on application.

The tenders are to be sent to me by not later than Six o'clock p.m. on Tuesday, the 7th of July, marked "Tender for Coals."

The lowest or any tender will not necessarily be accepted.

By order,
JOHN READ,
Secretary.

Gas Company's Office, Tunbridge Wells,
June 23, 1891.

COUNTY BOROUGH OF SALFORD.

TENDERS FOR GENERAL STORES.

THE Gas Committee of the Corporation are prepared to receive TENDERS for the following MATERIALS, in such quantities as may be required, during the Twelve months following the acceptance of Tender, viz.:—

1. Iron and Steel.
2. Tin Sheets, &c.
3. Lead and Composition Pipes, Glass, Pig Lead, &c.
4. Bolts, Nuts, Rivets, &c.
5. Iron Castings.
6. Brass Meter Taps and Keys.
7. Steam Tubing and Fittings.
8. Gas-Meters.
9. Paints, &c.
10. Chandlery.
11. Oils, &c.
12. Cotton Waste.
13. India-rubber Sheetings, Rings, &c.
14. Lias Lime and Cement
15. Timber.
16. Rope, Tarred and Spun Yarn.
17. Haulage.
18. Horse Provender.
19. Veterinary Attendance
20. Brushes and Besoms.
21. Steel Shovels.
22. Lime for Purifying.

Forms of tender, and all further information, may be obtained on application to the Engineer, Gas Offices, Bloom Street, Salford.

Sealed tenders, endorsed "Miscellaneous Goods," together with sample of goods offered, addressed to the Chairman of the Gas Committee, Town Hall, Salford, must be delivered to me not later than Five p.m., on Thursday, the 9th of July.

By order,
SAML. BROWN,
Town Clerk.

Town Hall, Salford,
June 17, 1891.

TENDERS FOR GAS COAL.

THE Directors of the Devonport Gas and Coke Company are prepared to receive TENDERS for the supply of 12,000 tons of unscreened GAS COAL, to be delivered at Tamar Wharf, Devonport, in quantities of about 1000 tons monthly.

Specifications may be obtained on application to

JOHN WILLIAMS,
Secretary.

Dated the 25th of June, 1891.

PADIHAM AND HAPTON LOCAL BOARD.

THE Gas Committee of the above Board invite TENDERS for a Two years' supply of GAS COAL, to be delivered (as required) at the Padiham Railway Station.

For particulars apply to the undersigned.

Sealed tenders, addressed to the Chairman of the Gas Committee, and endorsed "Gas Coal," to be sent to me not later than Monday, the 18th day of July next.

By order,
J. R. SMITH,
Clerk to the Board.

Local Board Offices, Padiham,
June 26, 1891.

LEEDS CORPORATION GAS DEPARTMENT.

THE Gas Committee are prepared to receive TENDERS for the purchase of the TAR produced at their Gas-Works for One, Two, or Three years, commencing on the 1st of September next.

Particulars and forms of tender may be obtained on application to Mr. James Lupton, at the Offices of the Gas Department, Municipal Buildings, Leeds.

Tenders, addressed to the Chairman of the Gas Committee at the above address, will be received not later than Wednesday, the 15th of July, 1891.

The Committee do not bind themselves to accept the highest or any tender.

NEW GAS-WORKS, HOLLINGWORTH, NEAR MANCHESTER.

THE Hollingworth Gas Company, Limited, invite TENDERS for the erection of a small GAS-WORKS on land in Hollingworth.

Full particulars may be obtained on application to Mr. James M. Veevers, Gas-Works, Denton, near Manchester.

Tenders, endorsed "Gas-Works," must be sent in to the undersigned on or before Monday, the 6th of July next.

AARON ROBERTS,
Secretary.

Gas Company, Hollingworth,
near Manchester, June 23, 1891.

BOLTON CORPORATION GAS DEPARTMENT.

THE Gas and Lighting Committee are prepared to receive TENDERS for the supply of best screened GAS COAL, COBBLES, and NUTS, and screened CANNEL, to be delivered between the 1st of August, 1891, and the 30th of June, 1892.

Tenders, addressed to the Chairman of the Gas and Lighting Committee, Gas Offices, Bolton, and endorsed "Tender for Gas Coal," &c., to be delivered on or before the 9th of July, 1891.

Specification with quantities, form of tender, and further information may be obtained from Mr. W. Walch, Gas Offices, Bolton.

R. G. HINNELL,
Town Clerk.

Town Hall, Bolton, June 24, 1891.

CONTRACT FOR GAS COALS.

NOTICE is hereby given, that the Local Board for the District of the Town of Horncastle, in the County of Lincoln, are prepared to receive TENDERS for the supply of from 500 to 1900 tons of best screened SILKSTONE GAS NUTS, to be delivered by the 30th of June, 1892, in such quantities and at such times as the Board may direct. The Coal to be sent in a dry condition, free from Hards, Smudge, Dirt, Shale, Pyrites, or other impurities.

Sealed tenders, marked "Tender for Gas Coal," to be sent to the Chairman of the Board, Mr. John Panton, St. Lawrence Street, Horncastle, on or before the 6th day of July, 1891.

The Board do not bind themselves to accept the lowest or any tender.

By order,
CHARLES DEE,
Clerk to the Board.

Horncastle,
June 24, 1891.

THE GASLIGHT AND COKE COMPANY.

NOTICE is hereby given, that the TRANSFER BOOKS of this Company, so far as they relate to the Company's Capital Stocks, WILL BE CLOSED on the evening of Tuesday, the 7th day of July next, and be reopened immediately after the Half-Yearly Meeting of the Company, to be held in the month of August next.

By order,
JOHN ORWELL PHILLIPS,
Secretary and General Manager.

Chief Office: Horseferry Road,
Westminster, S.W., June 27, 1891.

Now Ready, Price 6s., bound in Cloth.

THE CHEMISTRY OF ILLUMINATING GAS.

By NORTON H. HUMPHRYS, Assoc. M. Inst. C.E., F.C.S.

The matter composing this book consists mainly of articles written for, and published in, the JOURNAL. The preface says: "In view of new processes that seem to fall in thick and fast one on the other, it has been several times suggested that they should be collected together, so as to form a record of the various gas-making processes that have been proposed in the past, together with some account of the natural laws that govern the manufacture and supply of Illuminating Gas."

The work contains chapters on: The Relative Cost of Light from Gas, Oil, and Candles; Products of Combustion; The Sulphur Question; The Composition of Illuminating Gas; Water Gas Various Gas-Making Processes; Oil Gas; Properties of Fluid Hydrocarbons; Tar for Gas-Making; Destructive Distillation; Condensation; and Purification.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

BY ORDER OF THE DIRECTORS.

Important sale of 250 £5 Shares (fully paid) in the Romford Gas and Coke Company, Limited, upon which a Dividend of 7 per cent. is authorized to be paid by the Company's Act of Parliament, which Dividend may be increased or reduced by virtue of the usual Sliding Scale Clauses, and offering thoroughly sound investments.

MR. ALFRED RICHARDS is favoured with instructions to SELL THE ABOVE BY AUCTION at the Mart, Tokenhouse Yard, E.C., on Monday, July 27, 1891, at Twelve for One o'clock precisely, in lots.

Particulars may be obtained at the MART; of the SECRETARY to the Company, South Street, ROMFORD; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C., and TOTTENHAM.

MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Inventions may be secured for Twelve months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

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LARGE QUANTITY TO DISPOSE OF.

Illuminating Power over 20 Sperm Candles.

Yield of Gas per Ton, from 8000 to 9000 cubic feet, and Residuals in Proportion.

This Cannel being the bottom portion separated from a better Cannel, and the Coke being useless, it necessitates having a place where there is convenience for depositing the refuse, and at any such place this Cannel will make good Gas at little more than half the usual cost.

Sample wagons and quotations will be sent on application to

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EXCHANGE BUILDINGS,
MIRFIELD, *via* NORMANTON.

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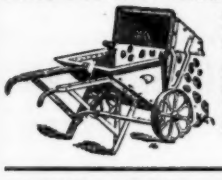

effecting a great saving of time, labour, and expense.

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Prices are Reduced.

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DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES and FIRE-CLAY and every Article suitable for
GAS AND WATER WORKS.

To effect a great saving in

GAS-FURNACES use our Special Derbyshire **GANNISTER BRICKS.**

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JAMES OAKES & Co.,
ALFRETON IRON-WORKS, DERBYSHIRE,
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Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter; and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

HEBBURN MAIN GAS COALS.

Produce of Gas per ton	10,500 feet.
,, Coke ,,	13½ cwt.
Illuminating Power	16 candles.

For Prices, f. o. b. Ship or delivered, apply to
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SEARCHES made *re* novelty, and opinions given on all matters connected with above. *Full particulars on application to*

J. C. CHAPMAN,
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Special experience in Gas and Ammonia Plant.

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GLASGOW.

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Consulting Chemist,
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FEES MODERATE.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD
BLACK BED GAS COAL.

Prices and Analysis on application.

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MIRFIELD, NORMANTON.

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Manufacturers of the "**Thomas**" Patent Lamps for general lighting, also for Public Buildings, Institutions, &c., and for outside purposes.

The best Regenerative Lamp in the Market.

Special quotations to Gas Companies.

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OUGHTIBRIDGE, near SHEFFIELD,
MANUFACTURE
SILICA BLOCKS, BRICKS, AND CEMENT
OF SUPERIOR QUALITY
FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
GREATER DURABILITY,
Strongly recommended where EXCESSIVE HEATS have to be maintained.

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QUOTATIONS ON APPLICATION TO
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CAST-IRON PIPES
FOR GAS AND WATER.

Pipes, One to Six inch Bore, kept in Stock. Also a very large assortment of all sizes of Bends, T-pieces, and Specials ready for despatch on receipt of Order.

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Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887, for

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TYNE BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

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PRESENT production nearly 3000 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16¼ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves 69 per cent. of excellent Coke. During the year 1890, the London Gas Companies carbonized about 400,000 tons of HOLMSIDE COALS. They are used by The Gaslight and Coke Company, the South Metropolitan Gas Company, the Woolwich (Government) Gas-Works, the Newcastle and Gateshead Gas Company, the European Gas Company, L'Union des Gaz, and by many other Gas Companies both at Home and Abroad.

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MANUFACTURER OF SULPHURIC ACID
OF EXTRA QUALITY FOR MAKING
WHITE SULPHATE OF AMMONIA.
TAR, LIQUOR, AND SPENT OXIDE Purchased for Cash against Delivery.

SOOTHILL WOOD CANNEL.

Yield of Gas per Ton, over 12,000 Cubic Feet.
Illuminating Power - - - - - 26 Candles.
Coke per Ton, - - - - - - - 57 per cent. of a quality almost equal to that made from the best Coking Coal.

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LANEMARK CANNEL
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Shipping Ports: All the principal Scotch Ports.

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GASHOLDERS,
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The Divisions in the Revolving Discs are filled with
"WOODEN CLUSTERS"
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They are also fitted with tubes for distributing Liquor over the Clusters.
Efficient in action and small driving power.
Patent four-blade exhausters to pass from 50,000 to 500,000 feet per hour.
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EXISTING EXHAUSTERS ALTERED TO PASS AN INCREASE OF 30 TO 50 PER CENT.
Using the same Valves, Connections, and Driving Power.
FRICTION 25 PER CENT. LESS THAN OTHER EXHAUSTERS.
THE DELIVERY OF GAS BEING MORE DIVIDED EACH REVOLUTION, THE GAUGE IS MORE STEADY
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WET AND DRY METERS,

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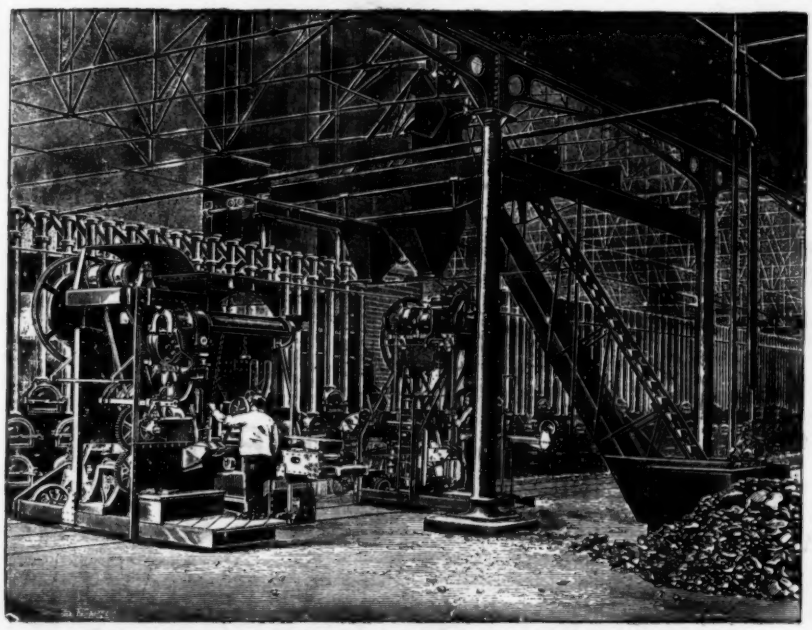

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HIGH-POWER LAMPS

Of every description, fitted with Copper Tops, Porcelain Cones, and Regulating High-Power Burners.

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No putty required.
Glass secured by hinged clips. No loose parts.
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Glass can be supplied cut ready for use.
The frames are not liable to be damaged as in ordinary lamps when hacking out a broken pane of glass.
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Several thousands of these are now in use, giving general satisfaction.
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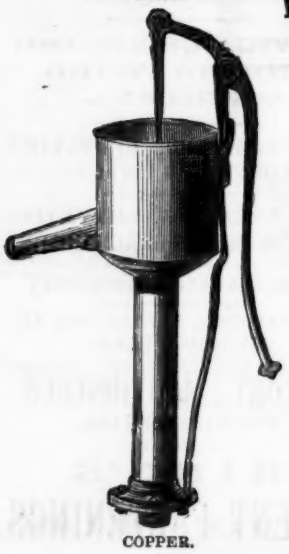

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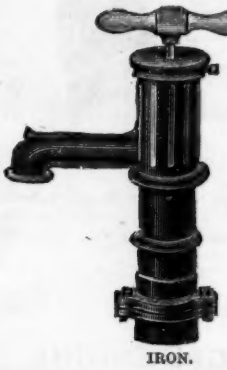

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By this process there is obtained—

1. A SAVING OF 70 PER CENT. IN THE CARBONIZING OF COAL.
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Which represents a saving of **One Million Sterling** per Annum to Gas Companies in the United Kingdom alone.

This System is being largely adopted at several places on the Continent and in America, and at various Gas-Works in England—notably at the Works of The Gaslight and Coke Company, the South Metropolitan Gas Company, and the Brentford Gas Company.

For Illustrated Description, see Advt. p. 1092.

THE PROCESS IS FULLY PATENTED, AND ANY INFRINGER WILL BE STRICTLY PROCEEDED AGAINST.

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ESTABLISHED 1825.

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MANUFACTURERS OF EVERY DESCRIPTION OF

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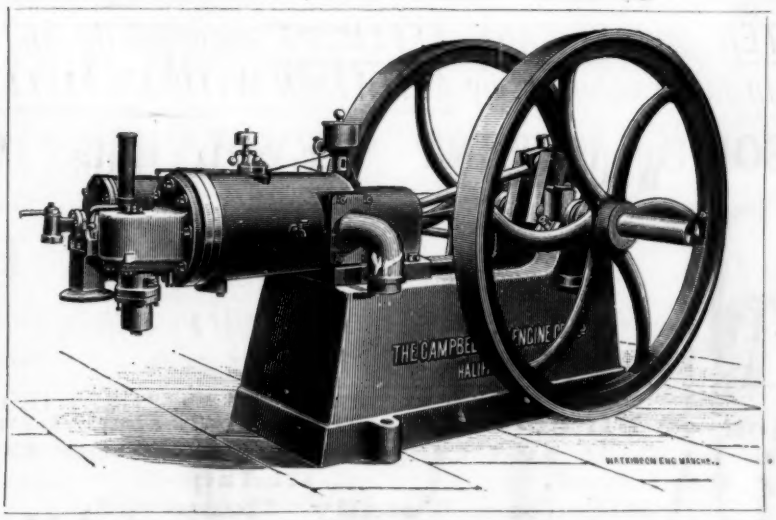
FOR ANY PURPOSE.

THE "CAMPBELL" GAS-ENGINE,

MOST SIMPLE AND MOST EASILY MANAGED.



MOST ECONOMICAL IN GAS AND LEAST LIABLE TO BREAKDOWNS.

Our Engines are used by Her Majesty's War Department; The South Metropolitan Gas Company, London, S.E.; at the Sydenham Gas-Works; Tiverton Gas-Works; Filey Gas-Works, &c.

Prices and full particulars from the sole makers—

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LONDON: 114, TOOLEY STREET, S.E. GLASGOW: 111, WEST GEORGE STREET.

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ALDWARKE MAIN GAS COAL

Analysis: 12,600 feet of 19-candle gas per ton.

Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.

Telegrams: "ATLAS SHEFFIELD."

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Makers of the

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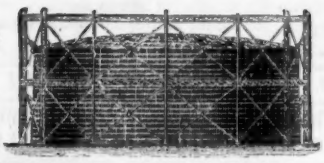
PATENT EXHAUSTERS,
PATENT ANTI-DIP PIPES,
BROOK'S GAS PRODUCER.



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RETORT SETTINGS IMPROVED

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THE "NUGENT" & "ROBUS" SETTINGS.

ECONOMY WITH DURABILITY GUARANTEED.

HUNDREDS OF SETTINGS WORKING EMINENTLY SATISFACTORY.

Estimates and Particulars for every Description of Retort Extensions and other Work.

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CONTRACTORS FOR GAS AND WATER WORKS,

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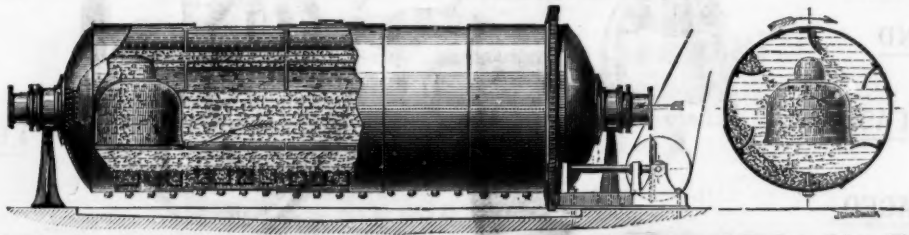
WATER PURIFICATION.

RIVER WATER and SEWAGE EFFLUENT successfully and economically treated in large volumes, by AGITATION WITH METALLIC IRON in

ANDERSON'S PATENT REVOLVING PURIFIER.



No Choking of Filter-Beds. | Simple & Rapid in its Action.
Colour due to Peat and Clay entirely Removed. | Organic Matter Considerably Reduced.
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Made in Fourteen Sizes, capable of treating singly from 4000 to 1¼ Million Gallons daily.

REVOLVING PURIFIER COMPANY, LIMITED,

DOCK HOUSE, BILLITER STREET, LONDON, E.C.

"THE METEOR."

NEW HIGH-POWER GAS-LAMP.

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Gas Companies should hire these Lamps to their Consumers, and introduce them for Street Lighting as a rival to the Electric Light, as they do not get out of order, are most economical, and the Burner being a circular slit does not choke up.

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Illustrated Pamphlet and Terms on application to J. E. FISHER, Stourbridge, Agent for England and Wales; to C. M. HAMILTON, Portland Place, Hamilton, Agent for Scotland and Ireland; and for all other Countries to the Patentee,

Geo. R. HISLOP, Gas Engineer, PAISLEY, N.B.

G. J. EVESON,

GAS COAL AND CANNEL CONTRACTOR,

PATENTEE OF

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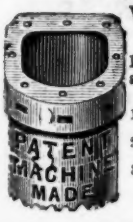

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2. They can be made in one piece up to 10 feet long.
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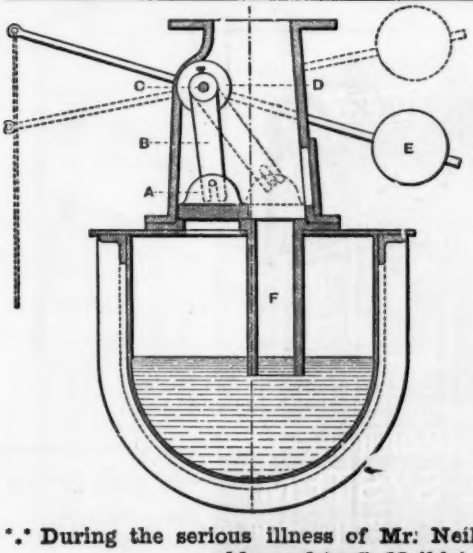

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Is perfectly reliable in action, and requires no attention.
Has all the advantages of the Dip and Anti-Dip combined.
Is cheap, and easily fixed to any form of main.
Will save more than their cost in one season's working.

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5, Norfolk Street, Manchester, Dec. 11, 1889.

SIR,—I have examined your Anti-Dip arrangement, and have seen it at work on the Retort-Benches at the Longwood Gas-Works, and the opinion which I have formed of its simplicity and certainty in working is distinctly favourable; so much so *that I consider it to be, without exception, the most efficient Appliance of the kind which has yet been introduced.* It can be applied to existing Benches with great ease, and at a minimum cost. So far as I am aware, it embodies a principle of action not previously applied in this direction.—Yours truly, THOS. NEWBIGGING.

Further particulars from the Sole Patentee and Manufacturer,

NEILL MEIKLEJOHN,
GAS ENGINEER,
LONGWOOD, HUDDERSFIELD.

*** During the serious illness of Mr. Neill Meiklejohn, all communications as to the above should be addressed to C. Meiklejohn, Gas Engineer, Oldbury, near Birmingham.

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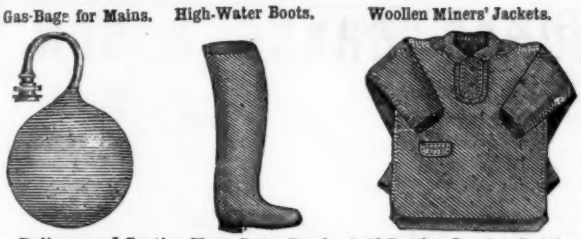

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BROWN'S PATENT

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PUTTYLESS STREET LAMP.

This Lamp may be supplied fitted with clear opal, or ribbed glass, *as also with enamel tops* if required. The necessary fittings for altering existing Lamps to this system can be supplied at moderate prices.

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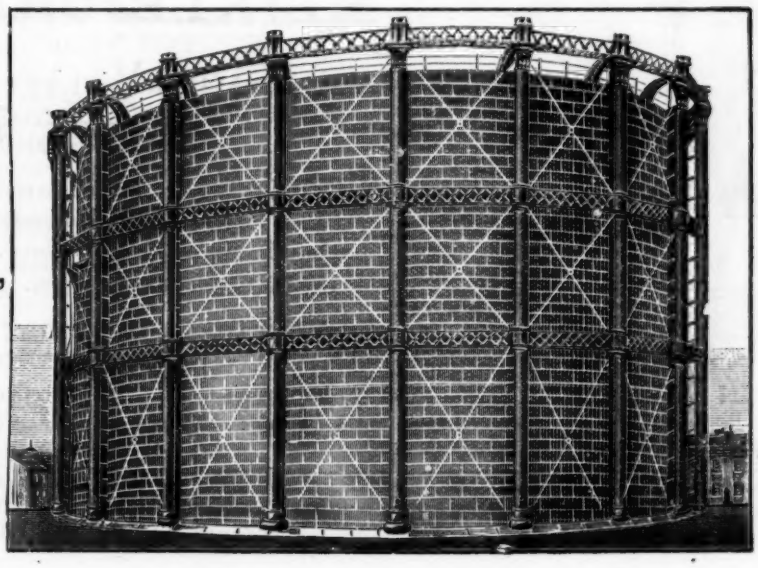

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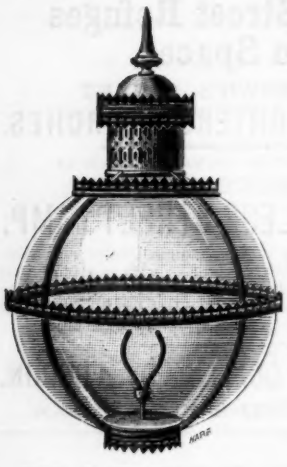

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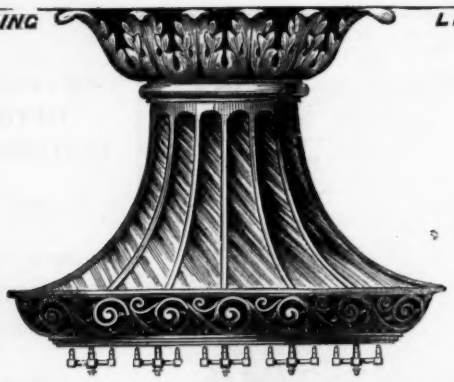

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[See also Advt., p. 1290.

London: Printed by WALTER KING (at the office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, June 30, 1891.